City of Grand Ledge

Well 2 Raw Water Main
Eaton County, Michigan

Project Manual
Project No. 221916

EXECUTED COPY

fishbeck
Engineers | Architects | Scientists | Constructors

PROJECT MANUAL
FOR
CITY OF GRAND LEDGE

WELL 2 RAW WATER MAIN
EATON COUNTY, MICHIGAN

May 15, 2023
Project Number 221916

ENGINEER

FISHBECK
1515 Arboretum Drive, SE
Grand Rapids, Michigan 49546
616.575.3824

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ADDENDUM
PAGE 1 OF 2

OWNER:	City of Grand Ledge City Hall 310 Greenwood Street Grand Ledge, MI 48837
ENGINEER:	Fishbeck 1515 Arboretum Drive, SE Grand Rapids, MI 49546
DRAWING REVISION NO.:	A1
ISSUED HEREWITH:	
SPECIFICATION SECTIONS:	00 11 13, 00 41 43, 01 21 13, 01 22 00, 01 35 46, 31 23 03, 33 05 30, 33 10 00
SHEETS:	Full Plan Set with changes on sheets 4, 11, 12, 14, 15, 16, and 23
BIDS DUE:	**June 22, 2023 at 10:00 a.m**.

This Addendum is issued to all Bid Set Holders, is a part of the Contract Documents, and modifies the previously issued Bidding Documents. Acknowledge receipt of this Addendum in the space provided on the Bid form; failure to do so may result in rejection of the Bid.

ITEM NO. 1:
Section: 00 11 13 – Advertisement For Bids

A. Bids due date extended 1 week. Bids Due June 22, 2023 at 10:00 a.m.

ITEM NO. 2:
Section: 00 41 43 – Bid – Unit Price (reissued)
01 22 00 – Unit Prices – Measurement and Payment (reissued)
01 35 46 – Contaminated Soil and Groundwater Procedures (issued)
31 23 03 – Excavation and Fill for Utilities (reissued)
33 05 30 – Utility Horizontal Directional Drilling (reissued)
33 10 00 – Water Utilities (reissued)

A. Potential contamination that could negatively impact the HDPE water main material may exist between stations 8+50 and 13+00. The Engineer is completing additional testing and sampling to determine whether the contamination exists at the proposed water main location and elevation. Test results will not be available until shortly after Bids are due. If potential contamination is confirmed to exist in this area the pipe material will be changed to Ductile Iron with NBR gaskets. Items are added to the bid form as an alternate for pricing purposes in case the change is necessary.
   1. HDD "A" (Station 9+20 to 15+12) would be installed utilizing HDD methods with ductile iron pipe and NBR gaskets.
   2. Open cut HDPE from Station 8+50 to 9+20 would change to Open Cut Ductile Iron with NBR gaskets.
   3. Fittings would change from HDPE fused to ductile Iron with NBR Gaskets.
   4. Additional "Water Main Fitting HDPE to DI Transition would be necessary and paid at Unit Bid Price Schedule already included in original bid.
   5. Environmental monitoring and worker PPE would be necessary if contamination is present.
   6. Non-Hazardous potentially contaminated soil handling and disposal would be necessary if contamination is present.

B. Section revisions/additions:
   1. Bid – Unit Price is reissued to include added alternate items.
   2. Unit Prices – Measurement and Payments reissued to include new pay items.
   3. Contaminated Soil and Groundwater Procedures is issued to be included in the Project.
   4. Excavation and Fill for Utilities is reissued to include requirements for handling and disposal of potentially contaminated materials.
   5. Utility Horizontal Direction Drilling reissued to include ductile iron pipe and gasket material requirements.

6. Water Utilities is reissued to include NBR gaskets.

ITEM NO. 3:
Section: 01 21 13 – Cash Allowances (reissued)
00 41 43 – Bid – Unit Price (reissued)

A. The Cash Allowance for Well 2 Electrical improvements is changing from $100,000 to $60,000 after receiving additional information.
B. The Bid – Unit Price is reissued to change Item 39 quantity.

ITEM NO. 4:
Section: Section 00 41 43 – Bid – Unit Price (reissued)

A. The Owner is considering the option to increase the size of the water main from 8-inch to 12-inch to accommodate a future potential well and the flow that would be added to this raw water main. Items have been added to the Bid – Unit Price for pricing purposes. Pay items have been changed from 8-inch to 12-inch. Specifications remain the same with the increase in pipe diameter. The “Combination Valve” model remains the same, however the pipe size in the valve chamber would be increased from 8-inch to 12-inch.
B. The new alternate pay items for Addendum Item No. 1 related to the potentially contaminated material are also included for bidding with the upsize from 8-inch to 12-inch.

ITEM NO. 5:
Sheet: Section 01 22 00 – Unit Prices – Measurement and Payment (reissued)

A. Pay item for Soil Erosion and Sedimentation Control adjusted to clearly include that the Contractor is responsible for applying for and obtaining the Soil Erosion Permit from the local Enforcing Agent.

ITEM NO. 6:
Sheets: 4 – Well 2 Raw Water Main – Raw Water Main Alignment (reissued)
11 – Degroff Street – POB to STA 9+00 – Raw Water Main (Reissued)
12 – Degroff Street – STA 9+00 to STA 18+00 – Raw Water Main (Reissued)
14 – Degroff Street – STA 26+00 to STA 34+00 – Raw Water Main (Reissued)
15 – Degroff Street – STA 33-00 to STA 37+00 – Raw Water Main (Reissued)
16 – Degroff and Franklin Street – STA 37-00 to STA 44+00 – Raw Water Main (Reissued)
23 – M-43 Water Main Crossing Details (Reissued)

A. Water main alignment alterations and notes changed in accordance with EGLE Part 399 permit review. Changes are relatively minor and identified on the reissued Sheets with Addendum 1 clouding.

END OF ADDENDUM

SECTION 00 11 13 - ADVERTISEMENT FOR BIDS

City of Grand Ledge

Well 2 Raw Water Main

1. RECEIPT OF BIDS

City of Grand Ledge, the Owner, will receive sealed Bids for construction of the Well 2 Raw Water Main project at the Grand Ledge City Hall, 310 Greenwood Street, Grand Ledge, Michigan 48837 until ~~June 15, 2023~~June 22, 2023 at 10- a.m. , local time. No Bids will be received after that time. Bids will be publicly opened and read aloud at that time and place.

2. SCOPE OF PROJECT

The Work covered by the Contract Documents comprises construction of a raw water main from Well 2, located at 425 East River Street to the City of Grand Ledge Water Treatment Plant at 320 East Saginaw Highway, Grand Ledge, MI 48837. The Work includes the following major items:

- Approximately 5,700 feet of 8-inch HDPE Raw Water Main to be installed utilizing both Horizontal directional drilling and open cut techniques including testing and appurtenances.
- Connection to the existing Well 2 discharge line.
- Connection to the existing water treatment plant raw water system.
- Furnish and install VFD at Well 2.
- Restoration of disturbed areas including bituminous paving, concrete surfacing, and lawn restoration.
- Temporary maintenance of traffic during construction.

3. FINANCING

The Project will be financed with funds provided by the Michigan Department of Environment, Great Lakes, and Energy's Drinking Water State Revolving Fund, and the Contract Documents reflect requirements by that agency.

4. ISSUING OFFICE

Bidding Documents are being issued from Fishbeck's Grand Rapids office. Bidders should direct questions and correspondence to that office.

5. EXAMINATION OF DOCUMENTS

Bidding Documents may be examined at the following locations after May 15, 2023 at 2 p.m., local time.

Fishbeck, 1515 Arboretum Drive, SE, Grand Rapids, Michigan 49546, 616.575.3824.

City of Grand Ledge, 310 Greenwood Street, Grand Ledge, Michigan 48837, 517.627.2194.

Builder's Exchanges: Grand Rapids and Lansing, Michigan.

Dodge Data & Analytics: Hot Springs, AR (formerly known as McGraw-Hill Dodge, Dodge Reports).

A list of entities to whom the Bidding Documents have been issued will be available online at www.fishbeck.com. Click on "Bid Sets/Bidders Lists."

6. OBTAIN BIDDING DOCUMENTS

Bidding Documents may be obtained (ordered) online, go to www.fishbeck.com, click on “Bid Sets/Bidders Lists.” Costs for electronic downloads is $1.25 per file, plus tax. Cost for printed sets of Bidding Documents is $60.00 plus tax and shipping. Individuals/companies that electronically download full sets or purchase printed sets are automatically added to the list of plan holders. Obtaining Bidding Documents from any source not identified herein may result in failure to receive addenda, corrections, or other revisions that may be issued.

7. BID SECURITY

Bid security in the amount, form and subject to the conditions provided in the Instructions to Bidders must be submitted with each Bid.

8. WITHDRAWAL OF BIDS

Bids may not be withdrawn for a period of 120 days after the actual date of opening thereof. This time period may be extended by mutual agreement of the Owner and any Bidder or Bidders.

9. RIGHT TO REJECT BIDS

The Owner reserves the right to waive any irregularities and to reject any and all Bids.

10. PREBID CONFERENCE

A prebid conference will be held on May 25, 2023 at 10 a.m. local time at 310 Greenwood Street, Grand Ledge, Michigan 48837. Prospective Bidders are encouraged to attend and participate in the conference, but attendance is not mandatory.

11. ON-SITE LABOR

Owner financing agency requires that all on-site construction labor be paid prevailing wages.

END OF SECTION 00 11 13

SECTION 00 41 43 - BID - UNIT PRICE

Bid of _____ hereinafter called Bidder, organized and existing under the laws of or a resident of the State of _____, doing business as _____.*

*Insert as applicable: "a corporation", "a partnership" or "an individual".

To the City of Grand Ledge, hereinafter called Owner.

ARTICLE 1 – BID RECIPIENT

1.01 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2 – BIDDER'S ACKNOWLEDGEMENTS

2.01 Bidder accepts all of the terms and conditions of the Advertisement for Bids and Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for 120 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

ARTICLE 3 – BIDDER'S REPRESENTATIONS

3.01 In submitting this Bid, Bidder represents that:

A. Bidder has examined and carefully studied the Bidding Documents, other related data identified in the Bidding Documents, and the following Addenda, receipt of all which is hereby acknowledged:

Addendum Number	Addendum Date
_____	_____
_____	_____
_____	_____
_____	_____

B. Bidder has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

C. Bidder is familiar with and is satisfied as to Laws and Regulations that may affect cost, progress, and performance of the Work.

D. Bidder has carefully studied all:

(1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) that have been identified in the Supplementary Conditions as provided in paragraph 5.03 of the General Conditions, as containing reliable "technical data," and

(2) reports and drawings of Hazardous Environmental Conditions, if any, at the Site that have been identified in the Supplementary Conditions as provided in paragraph 5.06 of the General Conditions as containing reliable "technical data."

E. Bidder has considered the information known to Bidder; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on:

(1) the cost, progress, and performance of the Work;

(2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying the specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents; and

(3) Bidder's safety precautions and programs.

F. Based on the information and observations referred to in Paragraph 3.01.E above, Bidder does not consider that further examinations, investigations, explorations, tests, studies or data are necessary for the determination of this Bid for performance of the Work at the price(s) bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents.

G. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.

H. Bidder has given Engineer written notice of all conflicts, errors, ambiguities or discrepancies that Bidder has discovered in the Bidding Documents, and the written resolution thereof by Engineer is acceptable to Bidder.

I. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work for which this Bid is submitted.

ARTICLE 4 – BIDDER'S CERTIFICATION

4.01 Bidder certifies that:

A. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization or corporation;

B. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid;

C. Bidder has not solicited or induced any individual or entity to refrain from bidding; and

D. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 4.01.D:

(1) "corrupt practice" means the offering, giving, receiving, or soliciting of any thing of value likely to influence the action of a public official in the bidding process;

(2) "fraudulent practice" means an intentional misrepresentation of facts made

(a) to influence the bidding process to the detriment of Owner,

(b) to establish bid prices at artificial non-competitive levels, or

(c) to deprive Owner of the benefits of free and open competition;

(3) "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which to establish bid prices at artificial non-competitive levels; and

(4) "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

ARTICLE 5 – BASIS OF BID

5.01 Bidder will complete the Work in accordance with the Contract Documents for the following unit prices:

Unit Bid Price Schedule					
Item No.	Item Description	Unit	Total Estimated Quantity	Unit Price	Bid Price
1	Cash Allowances - Testing	Dollars	40,000	$1.00	$40,000
2	Mobilization (5% Maximum of Total Bid)	LS	1		
3	Maintaining Traffic	LS	1		
4	Preconstruction Video Documentation	LS	1		
5	Grading, Roadway	Sta	9		
6	Remove Concrete Curb and Gutter	LF	800		
7	Remove Concrete Sidewalk and Drive Approaches	SYD	375		
8	Remove Pavement, Full Depth	SYD	1850		
9	Remove Sewer Manhole, Valve Chamber or Catch Basin	EA	1		
10	Remove Tree, 6-inch to 18-inch Diameter	EA	2		
11	Clearing	LS	1		
12	Remove, Salvage and Reinstall Sign	EA	2		
13	Soil Erosion and Sedimentation Control	LS	1		
14	Aggregate Base, 8-inch	SYD	2050		
15	Curb and Gutter, Concrete	LF	800		
16	Driveway Approach, HMA	Ton	65		
17	Driveway Approach, Concrete, 6 inch	SFT	450		
18	Pavement, HMA 3C	Ton	320		
19	Pavement, HMA 4C	Ton	160		
20	Restoration, Lawn	SYD	8500		
21	Sidewalk Ramp, Concrete, ADA	SFT	120		
22	Sidewalk, Concrete, 4-inch	SFT	1575		
23	Sidewalk, Concrete, 6-inch	SFT	1350		
24	Subbase	CYD	700		
25	Tree, (Ulmus 'New Horizon'), 3-inch	EA	2		
26	Pavement Markings	LS	1		
27	Casting, Manhole, Adjust	EA	6		
28	Casting, Valve Box, Adjust	EA	2		
29	Valve and Box, Gate, 8-inch	EA	2		
30	Water Main Fitting, 8-inch, DI	EA	8		

Unit Prices have been computed in accordance with Paragraph 13.03 of the General Conditions.

Bidder acknowledges that estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all unit price Bid items will be based on actual quantities, determined as provided in the Contract Documents.

_____

Bidder (Firm or Corporation Name)

Unit Bid Price Schedule					
Item No.	Item Description	Unit	Total Estimated Quantity	Unit Price	Bid Price
31	Water Main Fitting, 8-inch, HDPE	EA	26		
32	Water Main Fitting HDPE to DI Transition	EA	2		
33	Water Main, 8-inch, DI CL 52	LF	60		
34	Water Main, 8-inch, HDPE, DIPS, DR 11, Open Cut	LF	2040		
35	Water Main, 8-inch, HDPE, DIPS, DR 11, HDD	LF	3520		
36	Combination Valve and Chamber	EA	3		
37	Catch Basin, 4-foot diameter	EA	1		
38	Storm Sewer, 12-inch, C-76, CL IV	LF	10		
39	Cash Allowance - Well 2 Electrical Improvements	Dollars	60,000	$1.00	$60,000
40	Settlement Monitoring	LS	1		
	TOTAL OF ALL BID PRICES				

Bid Alternate Items:

Unit Bid Price Schedule					
Item No.	Item Description	Unit	Total Estimated Quantity	Unit Price	Bid Price
Alt-1	Water Main, 8-inch, DI CL 52, HDD	LF	592		
Alt-2	Water Main, 8-inch, DI CL 52, NBR Gasket	LF	70		
Alt-3	Water Main Fitting, 8-inch, DI, NBR Gasket	EA	4		
Alt-4	Environmental Monitoring and PPE	LS	1		
Alt-5	Non-Hazardous Potentially Contaminated Soil Handling and Disposal	CYD	150		
Alt-6	Valve and Box, Gate, 12-inch	EA	2		
Alt-7	Water Main Fitting, 12-inch, DI	EA	8		
Alt-8	Water Main Fitting, 12-inch, HDPE	EA	26		
Alt-9	Water Main Fitting HDPE to DI Transition, 12-inch	EA	2		
Alt-10	Water Main, 12-inch, HDPE, DIPS, DR 11, Open Cut	LF	2040		
Alt-11	Water Main, 12-inch, HDPE, DIPS, DR 11, HDD	LF	3520		
Alt-12	Combination Valve and Chamber, 12-inch Pipe	EA	3		
Alt-13	Water Main, 12-inch, DI CL 52, HDD	LF	592		
Alt-14	Water Main, 12-inch, DI CL 52, NBR Gasket	LF	70		
Alt-15	Water Main Fitting, 12-inch, DI, NBR Gasket	EA	4		
	TOTAL OF ALL ALTERNATE BID PRICES				

Unit Prices have been computed in accordance with Paragraph 13.03 of the General Conditions.

Bidder acknowledges that estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all unit price Bid items will be based on actual quantities, determined as provided in the Contract Documents.

Bidder (Firm or Corporation Name)

ARTICLE 6 – TIME OF COMPLETION

6.01 Bidder agrees that the Work will be substantially complete no later than October 18, 2024 and completed and ready for final payment in accordance with paragraph 15.06 of the General Conditions on or before November 1, 2024

6.02 Bidder agrees that the Work will be substantially complete within 105 calendar days once work begins on site.

6.03 Bidder agrees that work will not take place during specified events as outlined in the Summary of Work.

6.04 Bidder accepts the provisions of the Agreement as to liquidated damages.

6.05 Bidder acknowledges that the Work will not begin until the Funding Agency contracting requirements have been met and a contract is executed. It is anticipated that this will occur on August 28, 2023, but subject to change as determined by the Funding Agency.

ARTICLE 7 – ATTACHMENTS TO THIS BID

7.01 The following documents are submitted with and made a condition of this Bid:

A. Required Bid security.

B. Evidence of authority to sign Bid, if Bid is submitted by a corporation, partnership or joint venture;

C. Certification Regarding Debarment, Suspension, and Other Responsibility Matters.

ARTICLE 8 – DEFINED TERMS

8.01 The terms used in this Bid with initial capital letters have the meanings indicated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

ARTICLE 9 – BID SUBMITTAL

9.01 This Bid is submitted by:

SUBMITTED on_____, 20___ BY: _____

Date* Name of Bidder*

_____ _____

Business Street Address* Signature

_____ _____

City, State, and Zip* Name and Title of Signatory*

_____

Telephone Number*

_____

Facsimile Number*

_____

E-mail Address*

*Typed or printed in ink.

END OF SECTION 00 41 43

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SECTION 01 21 13 – CASH ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section provides for cash allowances which are included in the Contract Price.

B. Related Sections include Sections in Divisions 01 through 49, as identified below, provide additional information on what is covered by the respective allowances.

1.3 ALLOWANCES

A. Include in the Contract Price the following amounts:

1. The amount of $40,000 for payment of testing services by the independent testing laboratory as specified in Division 01 Section “Testing Services for Buried Utilities, Roadways, and Site Projects.”
2. The amount of ~~$100,000~~$60,000 for payment of Well 2 Electrical Improvements as specified in Division 26. The Owner will select the Electrical Contractor for this work item. The allowance is being utilized to allow flexibility and closer coordination of devices and implementation of the work. The intent is to utilize the same Electrical Contractor that will be working at the Iron Removal Plant (IRP) since this work potentially impacts operations at the IRP and within the Well 2 Wellhouse.

1.4 CASH ALLOWANCES

A. Costs Associated With Allowances:
1. All costs, associated with allowances, which are not specifically defined in the Schedule of Allowances, paragraph 1.3 of this Section shall be incidental to the major items of Work.
2. Associated costs not specifically defined in the Schedule of Allowances may include, but are not necessarily limited to:
   a. Unloading.
   b. Handling on the Site.
   c. Labor.
   d. Installation.
   e. Overhead.
   f. Profit.

1.5 ADJUSTMENT OF COSTS

A. Change Order: To adjust Contract Price if final cost is different from allowance.

B. Documentation:
1. Submit:
   a. Within 60 days after completion of the work under the allowance.
   b. Documentation of actual costs.
2. Failure to submit claims within the designated time will constitute a waiver of claims for additional costs.
3. At Contract closeout, reflect all approved changes in Contract amounts in the final statement of accounting.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION 01 21 13

SECTION 01 22 00 - UNIT PRICES - MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes descriptions of the method of measurement and the basis of payment for Unit Price Work under this Contract.

B. Basis of Contract Payments:
   1. Final Contract Price shall be determined by actual quantities installed at unit prices stated in Contractor's Bid.
   2. Engineer shall determine actual as-built quantities.
   3. All work identified on the Drawings, but not included as a Bid item shall be considered incidental to construction and not paid for directly, except Work that would be considered additional Work due to unforeseen conditions.
   4. Unit price payments for individual items shall include everything necessary for such item to function as intended in the system.
   5. Owner reserves the right to increase, decrease or eliminate any quantities for items listed in Contractor's Bid or which become a part of the Contract Documents.

C. Items included as incidental to Unit Prices for systems and appurtenances. Unless there is a specific pay item identified, the unit price payment shall include, but not be limited to:
   1. Clear, excavate, trench, bedding, trench backfill, compaction, disposal of items for clearing and unsuitable or excess excavated materials.
   2. Drainage of excavations including by-pass pumping of sewers if necessary**.**
   3. Temporary sheeting, bracing and shoring of excavations.
   4. Support, relocation, replacement, connection or reconnection of existing pipelines and utilities.
   5. Cleanup and surface restoration.
   6. Water service repair.
   7. Sewer lead repair.
   8. Bulk head of pipes to be abandoned.
   9. Removal of pipes, valves, structures and appurtenances located within the excavation limits of new utilities whether identified on the removal Drawing or not.
   10. Coordination of mail delivery and refuse removal with residents, post office, and refuse collectors.
   11. Dewatering for the installation of sanitary sewer, water main and storm sewer.
   12. Support of utility poles and existing underground utilities during excavation and installation of sanitary sewer, water main and storm sewer.
   13. Remove, salvage, and replace street signs.
   14. Remove and dispense of trees less than 6-inches in diameter.
   15. Protection of the work area including temporary fencing in park areas and other locations as necessary.

1.3 FISHBECK STANDARD PAY ITEMS - GENERAL REQUIREMENTS

A. Items for General Requirements include:

   1. Pay Item - Cash Allowance - Testing:
      a. Includes cash allowance for testing requirements in accordance with Division 01 Section "Testing Services for Buried Utilities, Roadways, and Site Projects."
      b. Unit of measure:
         1) Actual dollars paid to independent laboratory.
         2) General Contractor allowable mark-up is 10%.
         3) Documented by invoices.

2. Pay Item - Mobilization (5% Maximum of Total Bid):
   a. Includes:
      1) Preparatory work and expenses incurred prior to beginning work onsite.
      2) Transport materials, personnel, and equipment to the Site.
      3) Establish temporary onsite construction facilities.
      4) Provide insurance, bonds, and other costs associated with the project in general and not included in other pay items.
      5) All required submittals.
   b. Unit of Measure:
      1) Lump sum.
      2) 50% payment will be made after 5% of the original contract amount is earned.
      3) Final 50% payment will be made after 25% of the contract amount is earned.

3. Pay Item - Maintaining Traffic:
   a. Includes the following in accordance with Division 01 Sections "Summary of Work" and "Traffic Control:"
   b. Furnish, install, and maintain:
      1) Flag control.
      2) Detour signing.
      3) Work zone signing.
      4) Traffic control devices including barricades and barrels.
      5) Removal of conflicting pavement markings.
      6) Temporary pavement markings.
      7) Maintain access to residential driveways.
      8) Maintain access to commercial driveways.
      9) Temporary gravel as necessary to maintain driveway access.
   c. Unit of measure:
      1) Lump sum.
      2) 50% payment shall be made for installation of traffic control devices.
      3) 50% payment shall be made after removal of traffic control devices.

1.4 EXISTING CONDITIONS

A. Items for Existing Conditions include:

1. Pay Item - Preconstruction Video Documentation:
   a. Includes the following in accordance with Division 02 Section “Preconstruction Audio-Visual Documentation.”
      1) All DVD/Video CD disks.
      2) Reports.
   b. Measurement and Payment:
      1) Lump sum.
      2) Payment will be made after the Engineer has reviewed the audio-video documentation for completeness.

1.5 EARTHWORK

A. Items for Earthwork include:

1. Pay Item - Grading, Roadway:
   a. Includes the following in accordance with Division 31 Section "Grading:"
      1) Clear site and dispose of unsuitable materials within grading limits.
      2) Remove and stockpile topsoil.
      3) Cut, fill, shape, grade, compact, or otherwise prepare a finish subgrade.
      4) Proof roll subgrade to meet density requirements.
      5) Shape, grade, and compact onsite subbase material.
      6) Protect, salvage, or replace private irrigation systems in the project limits.
   b. Unit of Measure:
      1) Station.
      2) Measured along centerline of roadway only where roadway reconstruction work is occurring.

3) Is not paid where Horizontal Directional Drilling is occurring or in areas where only driveways or lawn restoration is occurring. .

2. Pay Item - Remove Concrete Curb and Gutter:
   a. Includes the following in accordance with Division 31 Sections "Grading" and "Excavation and Fill for Utilities."
      1) Sawcut, remove, and dispose of existing concrete curbs, integral curb and gutter, and gutter pans.
   b. Unit of Measure: Foot.

3. Pay Item - Remove Concrete Sidewalk and Drive Approaches:
   a. Includes the following in accordance with Division 31 Sections "Grading" and "Excavation and Fill for Utilities."
      1) Sawcut, remove, and dispose of existing concrete walks and drive approaches and remove base materials to obtain proposed grade.
   b. Unit of Measure: Square yard.

4. Pay Item - Remove Pavement, Full Depth:
   a. Includes the following in accordance with Division 31 Sections "Grading" and "Excavation and Fill for Utilities:"
      1) Sawcut, remove (full depth) and dispose of existing bituminous, concrete, and composite pavement materials.
   b. Unit of Measure: Square yard.

5. Pay Item - Remove Sewer Manhole, Valve Chamber or Catch Basin:
   a. Includes the following in accordance with Division 31 Section "Excavation and Fill for Utilities:"
      1) Excavate, remove and dispose of existing concrete or brick storm or sanitary sewer manholes or catch basins not within the excavation limits of new construction.
      2) Backfill and compaction.
   b. Unit of measure: Each.

6. Pay Item - Remove Tree _ to __-inch Diameter:
   a. Includes the following in accordance with Division 31 Section "Grading:"
      1) Remove trees, including stumps and roots, to 2 feet below finished grade, dispose of stumps and roots.
      2) Dispose of all tree material not specifically retained by property owner.
   b. The size of trees shall be determined by the average diameter of the tree trunk, measured to the nearest full inch, at a point 4-1/2 feet above the base of the tree from the ground line. Trees having major limbs lower than 4-1/2 feet from the ground shall be measured at the smallest diameter below such limbs.
   c. Does not include the removal of trees in designated clearing areas.
   d. Unit of Measure:
      1) Several trees originating from the same ground level trunk shall be measured separately.
      2) Each.

7. Pay Item – Clearing:
   a. Includes the following in accordance with Division 31 Section “Grading”
      1) Remove all plants, including shrubs, brush, trees and stumps in clearing area.
      2) Protect all vegetation not designated for removal adjacent to clearing area.
      3) Dispose of removed materials.
   b. Unit of Measure: Lump Sum

8. Pay Item - Remove, Salvage and Reinstall Sign:
   a. Includes the following in accordance with Division 31 Section “Grading”
      1) Remove and salvage signs and posts.
      2) Store and protect salvaged sign and sign posts.
      3) Furnish and maintain temporary regulatory signs.
      4) Reinstall salvaged sign and sign posts in accordance with the MUTCD
      5) Furnish and install new sign and sign posts to replace those damaged by construction or stolen.
   b. Unit of Measure: Each.

9. Pay Item - Soil Erosion and Sedimentation Control:
   a. Includes the following in accordance with Division 31 Sections "Erosion and Sedimentation Controls:"
      1) Review the soil erosion control plan and Soil Erosion Control Permit.
      2) Install and maintain the required soil erosion and sedimentation control measures as indicated on the Drawings and any other measure as necessary to adequately control soil erosion and sedimentation on the project.
      3) Submit copies of product information for all SESC BMP's.
      4) Submit Certificate of Certified Storm Water Operator.
      5) Organize and proceed over SESC Preconstruction Meeting. Provide inspections by a certified Storm Water Operator and submit reports until Notice of Termination is Issued.
      6) Maintain Storm Water Operators Log during construction and provide to Engineer at completion of project.
      7) Sweep and clean roadways and sidewalks as required.
      8) Maintain dust control.
      9) Maintain silt fence, catch basin inlet filters and all other BMP's as required.
      10) Clean new catch basins and storm sewers at the completion of construction if needed.
      11) Clean exiting catch basins and storm sewers near construction project if impacted by construction.
      12) Remove temporary soil erosion and sedimentation control measures after site is stabilized.
      ~~12)~~13) Complete SESC permit and pay all Permit fees to the local Enforcing Agent.
   b. Unit of Measure:
      1) Lump sum.
      2) 50% payment shall be made for installation of soil erosion and sedimentation control measures.
      3) 50% payment shall be made upon project completion after removal of soil erosion and sedimentation control measures.
      4) Payment for SESC measures beyond those identified on the Drawings required by Contractors operations will not be considered for additional payment.
      5) Payment for additional SESC measures required by Engineer will be administered through the Change Order process.

1.6 EXTERIOR IMPROVEMENTS

A. Items for Exterior Improvement Include:

1. Pay Item - Aggregate Base, __ inch:
   a. Includes the following in accordance with Division 32 Section "Aggregate Base Courses:"
      1) Furnish, place, and compact base material.
      2) Prepare subgrade.
      3) Proof roll subgrade.
      4) Furnish, place, and compact aggregate for bituminous or concrete pavement.
   b. Unit of measure: Square yard, compacted in place.

2. Pay Item - Curb and Gutter, Concrete:
   a. Includes the following in accordance with Division 32 Section "Concrete Curbs and Gutters:"
      1) Furnish and place concrete curb and gutter, gutter pans, curb radii.
      2) Provide longitudinal reinforcement.
      3) Provide lane ties where curb is adjacent to concrete paving.
   b. Unit of measure: Foot measured along the face of the curb, radii and gutter pans.

3. Pay Item - Driveway Approach, HMA:
   a. Includes the following in accordance with Division 32 Section “Asphalt Paving.”
      1) Prepare subgrade.
      2) Furnish, place, and compact base material to a minimum depth of 6 inches.
      3) Furnish and place HMA paving.
   b. Unit of measure: Ton.

4. Pay Item - Driveway Approach, Concrete, __-inch:
   a. Includes the following in accordance with Division 32 Section "Concrete Walks:"
      1) Prepare subgrade.

2) Furnish, place, and compact base material to a minimum depth of 6 inches.
3) Furnish and place concrete paving.
4) Provide additional cement in mix for High Early concrete.

b. Unit of measure: Square foot.

5. Pay Item - Pavement, HMA 3C & 4C:
   a. Includes the following in accordance with Division 32 Section "Asphalt Paving:"
      1) Prepare aggregate base.
      2) Furnish, place, and compact bituminous leveling and top course mixture.
   b. Unit of measure: Ton.

6. Pay Item - Restoration, Lawn:
   a. Includes the following in accordance with Division 31 Sections "Grading" and Division 32 Section "Turf and Grasses:"
      1) Furnish, place, and grade topsoil.
      2) Place hydroseed.
      3) Place mulch and mulch anchoring.
      4) Maintain until final completion.
   b. Does not include restoration of any areas disturbed due to Contractor's operation that are outside the limits of normal construction.
   c. Unit of measure: Square yard

7. Pay Item - Sidewalk Ramp, Concrete, ADA:
   a. Includes the following in accordance with Division 32 Section "Concrete Walks:"
      1) Furnish and place EJIW Cast Iron Detectable Warning Strips (24-inch by 60-inch per ramp).
   b. Does not include concrete walk surrounding tactile warning plate. Surrounding concrete to be paid concrete sidewalk.
   c. Unit of measure: Square feet of tactile warning plate placed.

8. Pay Item - Sidewalk, Concrete __-inch:
   a. Includes the following in accordance with Division 32 Section "Concrete Walks:"
      1) Prepare subgrade.
      2) Furnish, place, and compact base material.
      3) Furnish and place concrete sidewalks.
      4) Provide additional cement for High Early strength concrete in concrete pours where drives must be open to traffic within 24 hours.
   b. Unit of measure: Square feet.

9. Pay Item - Subbase:
   a. Includes the following in accordance with Division 32 Section "Aggregate Base Courses:"
      1) Furnish, place, and compact subbase material.
      2) Prepare subgrade.
      3) Proof roll subgrade.
   b. Unit of measure: Cubic yard, compacted in place.

10. Pay Item - Tree, (Species), __-inch:
    a. Includes the following in accordance Division 32 Section "Planting."
       1) Furnish and install trees.
       2) Water and maintain trees until final completion.
    b. Unit of measure: Each.

11. Pay Item – Pavement Markings
    a. Includes the following in accordance with Division 32 Section “Pavement Markings”
       1) Furnish and place white or yellow pavement marking paint.
       2) Furnish and place cold plastic pavement markings.
    b. Unit of Measure: Lump Sum

1.7 UTILITIES - MISCELLANEOUS

A. Items for Miscellaneous Utilities include:

1. Pay Item - Casting, Manhole, Adjust:
   a. Includes the following in accordance with Division 33 Section "Storm Drainage Utilities:"
      1) Sawcut existing pavement, curb, and curb and gutter where required.
      2) Adjust the existing casting up or down to the finish grade.
      3) Remove and replace the pavement adjacent to the adjusted cover.
   b. Unit of Measure: Each.

2. Pay Item - Casting, Valve Box, Adjust:
   a. Includes the following in accordance with Division 33 Sections "Water Utilities":
      1) Sawcut existing pavement, curb, and curb and gutter where required.
      2) Adjust the existing casting up or down to the finish grade.
      3) Remove and replace the pavement adjacent to the adjusted cover.
   b. Unit of Measure: Each.

1.8 UTILITIES - WATER UTILITIES

A. Items for Water Utilities include:

1. Pay Item - Valve and Box, Gate, __-inch:
   a. Includes the following in accordance with Division 33 Section "Water Utilities:"
      1) Furnish and install valve and valve box adjusted to finished grade.
   b. Unit of Measure: Each.

2. Pay Item - Water Main Fitting, __-inch, DI:
   a. Includes the following in accordance with Division 33 Section "Water Utilities:"
      1) Furnish and install fitting and joint restraint.
   b. Unit of Measure:
      1) Each.
      2) Fitting size is determined by the largest diameter connection.
   c. Unit of Measure: Each.

3. Pay Item - Water Main Fitting, __-inch, HDPE:
   a. Includes the following in accordance with Division 33 Section "Water Utilities:"
      1) Furnish and install fitting.
   b. Unit of Measure:
      1) Each.
      2) Fitting size is determined by the largest diameter connection.

4. Pay Item – Water Main Fitting, HDPE to DI Transition:
   a. Includes the following in accordance with Division 33 Section “Water Utilities:”
      1) Furnish and install fittings to complete the transition.
      2) Heat fused HDPE transition.
      3) Stiffener spool on the inside of the HDPE.
      4) Mechanical joint connection to DI pipe or fitting
      5) Furnish and install concrete anchor.
   b. Unit of Measure:
      1) Each.
      2) Fitting size is determined by the largest diameter connection.

5. Pay Item - Water Main, __-inch, DI CL__:
   a. Includes the following in accordance with Division 31 Sections "Excavation and Fill for Utilities" and Division 33 Section "Water Utilities:"
      1) Furnish, install, and test water main.
      2) Excavate, backfill, and compact trench.
      3) Provide pipe bedding and trench backfill material.

b. Unit of Measure:
   1) Foot.
   2) Measure from center of fitting to center of fitting along centerline of pipe.

6. Pay Item - Water Main, __-inch, HDPE ____, Open-Cut:
   a. Includes the following in accordance with Division 31 Sections "Excavation and Fill for Utilities" and Division 33 Section "Water Utilities:"
      1) Furnish, install, and test water main.
      2) Excavate, backfill, and compact trench.
      3) Tracer wire.
      4) Provide pipe bedding and trench backfill material.
   b. Unit of Measure:
      1) Foot.
      2) Measure from center of fitting to center of fitting along centerline of pipe.

7. Pay Item – Water Main, __-inch, HDPE ____, HDD:
   a. Includes the following in accordance with Division 31 Sections “Excavation and Fill for Utilities” and Division 33 Sections "Utility Horizontal Directional Drilling” and “Water Utilities:”
      1) Excavation and backfill of boring and receiving pits.
      2) Water Main: Furnished and installed: High Density Polyethylene.
      3) Fusing and assembly and staging of pipe
      4) Barricading and protection of uninstalled pipe.
      5) Installation by horizontal directional drill methods.
      6) Determination of means and methods for completing the HDD installation including but not necessarily limited to, maintaining hole stability and pulling new pipe back through the hole while protecting all existing structures, pavement, and utilities.
      7) Locating potential utility crossing elevations of the HDD path and determining route to avoid damage to existing crossings.
      8) Tracer Wire
      9) Provide pipe bedding and trench backfill material.
      10) Testing
   b. Unit of Measure: Foot.
   c. Measure from center of fitting to center of fitting along centerline of pipe of installed and connected. Additional length of pipe for entrance and exit of bore is incidental and shall be included in the per foot cost.

8. Pay Item – Combination Valve and Chamber:
   a. Includes the following in accordance with Division 31 Sections “Excavation and Fill for Utilities” and Division 33 Sections and Division 40 “Combination Air Valves:”
      1) Furnish and install precast concrete structure, including steps, flow channel and pipe connections.
      2) Furnish and install casting, adjusted to finish grade.
      3) Furnish and install all water main fittings and mechanical joint restraints from HDPE Transition to HDPE Transition.
      4) Furnish, install and test combination valve.
      5) Furnish and install vent piping as identified on detail.
      6) Provide stone and geotextile fabric.
      7) Excavate, install foundation material, and backfill around catch basin.
      8) Provide resilient connector between pipe and manhole
      9) Provide pipe bedding and trench backfill material.
   b. Unit of Measure: Each.

1.9 UTILITIES - STORM DRAINAGE UTILITIES

A. Items for Storm Drainage Utilities include:

1. Pay Item - Catch Basin, __-foot diameter:
   a. Includes the following in accordance with Division 31 Section "Excavation and Fill for Utilities" and Division 33 Section "Storm Drainage Utilities:"
      1) Furnish and install precast concrete drainage structure, including steps, flow channel and pipe connections and sump.
      2) Furnish and install casting, adjusted to finish grade.
      3) Provide stone and geotextile fabric.
      4) Excavate, install foundation material, and backfill around catch basin.
      5) Provide resilient connector between pipe and manhole for all pipe diameters less than or equal to 24 inch.
   b. Unit of Measure: Each.

2. Pay Item - Storm Sewer, __-inch, C-76, CL__:
   a. Includes the following in accordance with Division 31 Section "Excavation and Fill for Utilities" and Division 33 Section "Storm Drainage Utilities:"
      1) Furnish and install and storm sewer.
      2) Excavate, backfill and compact trench.
      3) Provide pipe bedding and trench backfill material.
      4) Connect to existing storm sewer, including geotextile fabric wrap.
      5) Connect to existing storm structure.
   b. Unit of Measure:
      1) Linear foot.
      2) Measure from centerline of drainage structure to centerline of drainage structure or end of pipe along the centerline.

1.10 PROJECT SPECIFIC PAY ITEMS

A. Project Specific Items include:

1. Pay Item – Cash Allowance - Well 2 Electrical Improvements:
   a. Includes Cash Allowance for the following in accordance with Division 26 Specifications.
      1) Furnish, install and test all electrical items associated with Well 2 electrical improvements as identified in the drawings and details.
   b. Unit of Measure:
      1) Actual dollars paid to Electrical Integrator as selected by the Owner
      2) General Contractor allowable mark-up is 10%
      3) Documented by invoices

2. Pay Item - Settlement Monitoring:
   a. Includes the following in accordance with Division 01 Section “Monitoring of Existing Conditions”
      1) Preconstruction Survey.
      2) Installation of monitor points.
      3) Monitoring of settlement markers.
      4) Reporting.
      5) Removal of monitor points.
   b. Unit of Measure: Lump Sum.

1.11 BID ALTERNATE PAY ITEMS

A. Items for Bid Alternate include:

1. Pay Item – Water Main, -inch, DI CL 52, HDD:
   a. Includes the following in accordance with Division 31 Section “Excavation and Fill for Utilities” and Division 33 Sections "Utility Horizontal Directional Drilling” and “Water Utilities:”
      1) Excavation and backfill of boring and receiving pits.
      2) Water Main: Furnished and installed: Ductile Iron Class 52.
      3) Nitrile (NBR) Gaskets at all joints.
      4) Polyethylene encasement.
      5) Fusing and assembly and staging of pipe.
      6) Barricading and protection of uninstalled pipe.
      7) Installation by horizontal directional drill methods.
      8) Determination of means and methods for completing the HDD installation including but not necessarily limited to, maintaining hole stability and pulling new pipe back through the hole while protecting all existing structures, pavement, and utilities.
      9) Locating potential utility crossing elevations of the HDD path and determining route to avoid damage to existing crossings.
      10) Tracer Wire.
      11) Provide pipe bedding and trench backfill material.
      12) Testing.
   b. Unit of Measure: Foot.
      1) Measure from center of fitting to center of fitting along centerline of pipe of installed and connected. Additional length of pipe for entrance and exit of bore is incidental and shall be included in the per foot cost.

2. Pay Item - Water Main, -inch, DI CL 52, NBR Gasket:
   a. Includes the following in accordance with Division 31 Section "Excavation and Fill for Utilities" and Division 33 Section "Water Utilities:"
      1) Furnish, install, and test water main.
      2) Excavate, backfill, and compact trench.
      3) Provide pipe bedding and trench backfill material.
      4) Nitrile (NBR) Gaskets.
      5) Polyethylene Encasement.
   b. Unit of Measure:
      1) Foot.
      2) Measure from center of fitting to center of fitting along centerline of pipe.

3. Pay Item - Water Main Fitting, __-inch, DI, NBR Gasket:
   a. Includes the following in accordance with Division 33 Section "Water Utilities:"
      1) Furnish and install fitting and joint restraint.
      2) Nitrile (NBR) Gasket.
   b. Unit of Measure:
      1) Each.
      2) Fitting size is determined by the largest diameter connection.

4. Pay Item – Environmental Monitoring and PPE:
   a. Includes the following in accordance with Division 01 Section “Contaminated Soil and Groundwater Procedures:”
      1) Review and understand included Environmental Management Plan (EMP).
      2) Comply and follow Breathing Zone monitoring procedures and requirements.
      3) Personal Protective Equipment (PPE).
   b. Unit of Measure: Lump Sum.

5. Pay Item – Non-Hazardous Potentially Contaminated Soil Handling and Disposal:
    a. Included the following in accordance with Division 01 Section "Contaminated Soil and Groundwater Procedures" and Division 31 Section "Excavation and Fill for Utilities:"
        1) Stockpile potentially contaminated soils for testing purposes.
        2) Loading and transport of soils to designated disposal facility after testing has been completed. (For purposes of the Bid, assume the disposal facility is within 30 miles of the Site.)
    b. Does not Include the following:
        1) Sampling and testing of soil which will be completed and paid for by the Owner.
        2) Tip fees at the landfill which will be paid for by the Owner.
    c. Unit of Measure:
        1) Cubic yard as determined by landfill weigh ticket.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION 01 22 00

SECTION 01 35 46 – CONTAMINATED SOIL AND GROUNDWATER PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the procedures for handling contaminated or potentially contaminated soil and groundwater.

1.3 REFERENCES

A. Except as herein specified or as indicated on the Drawings, the work of this Section shall comply with the following:
   1. MDOT:
      a. 2003 Standard Specifications for Construction.
      b. Standard Plans.
   2. Federal Regulation 29 CFR Part 1910.120.

1.4 DEFINITIONS

A. Abbreviations:
   1. VOC: Volatile Organic Chemicals.
   2. HAA: Health Advisory Area.
   3. OSHA: United States Occupational Safety and Health Administration.
   4. MDPH: Michigan Department of Public Health.
   5. MIOSHA: Michigan Occupational Safety and Health Administration.
   6. NPDES: National Pollution Discharge Elimination System.

B. Terms:
   1. Temporary Exclusion Zone:
      a. A designated area where the possibility of contact with hazardous materials exists.
      b. Personnel working in area must meet health and safety training requirements in accordance with Federal Regulation 29 CFR Part 1910.120 until the area has been determined to be clean.
   2. Exclusion Zone:
      a. A designated area where contact with hazardous materials is expected.
      b. Personnel working in area must meet health and safety training requirements in accordance with Federal Regulation 29 CFR Part 1910.120.
   3. Clean Area:
      a. A designated area where the possibility of contact with hazardous materials has been removed.
      b. Personnel working in this area are not required to meet health and safety training requirements in accordance with Federal Regulation 29 CFR Part 1910.120.
   4. Health Advisory Area:
      a. A portion of the Site, as indicated on the Drawings, which has been designated by the MDPH.
      b. Water from private water supply wells in the HAA has been found to contain VOCs.

1.5 PERFORMANCE REQUIREMENTS

A. Be Responsible For:
   1. Complying with requirements of Federal Regulation 29 CFR Part 1910.120.
   2. Health and safety training for Contractor's employees.
   3. Providing employees with adequate protective equipment.

B. Temporary Exclusion Zone:
   1. Initially: An area surrounding excavation work within the HAA.
   2. After initial testing and monitoring: Owner will designate the area as either a Clean Area or an Exclusion Zone.

C. Clean Area: Monitor to ensure that the area remains free from exposure to hazardous materials.

D. Exclusion Zone: Monitor to ensure proper compliance with Federal Regulations.

1.6 SUBMITTALS

A. Certificates of Health and Safety Training:
   1. Prior to the start of excavation in the HAA.
   2. For employees who may work in a Temporary Exclusion Zone and an Exclusion Zone.

1.7 PROJECT CONDITIONS

A. Engineer's Health and Safety Plan:
   1. For Engineer's use only.
   2. Available as information for Contractor.
   3. Engineer may monitor for contaminants:
      a. In compliance with Engineer's Health and Safety Plan.
      b. Results will be made available for Contractor's information.

B. Environmental Management Plan (EMP):
   1. EMP has been prepared for work in the area as described in the EMP.
   2. EMP is included as an attachment to this specification section.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION 01 35 46

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Environmental Management Plan

SUBJECT: Installation of 8-inch Raw Water Line form Well 2 to Grand Ledge Iron Removal Plant
Grand Ledge, Michigan

DATE: May 23, 2023 **PROJECT NO.:** 221916

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Abbreviations/Acronyms

bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylene
BZ	breathing zone
City	City of Grand Ledge
EGLE	Michigan Department of Environment, Great Lakes, and Energy
EMP	Environmental Management Plan
FAR	Final Assessment Report
ft	foot/feet
ft/ft	feet per foot
HDPE	high-density polyethylene
IDLH	Immediately Dangerous to Life or Health
LEL	lower explosive limit
MTBE	methyl-tert butyl ether
NREPA	Natural Resources and Environmental Protection Act
OSHA	Occupational Safety and Health Administration
PEL	permissible exposure limit
PID	photoionization detector
PPE	personal protective equipment
ppm	parts per million
ROW	right-of-way
TMB	trimethylbenzene
TWA	time-weighted average
UST	underground storage tank
VOC	volatile organic compound

Introduction

An Environmental Management Plan (EMP) has been developed for the installation of the 8-inch raw water line in Grand Ledge, Michigan. In accordance with Michigan's Part 201 of the Natural Resources and Environmental Protection Act (NREPA) also known as the *Michigan Environmental Remediation Act*, Part 213 of the NREPA, and the Occupational Safety and Health Administration (OSHA) regulations: 29 CFR 1910, Occupational Safety and Health Standards, Section Subpart Z – *Toxic and Hazardous Substance*. An EMP outlines the strategies, actions, and procedures to be implemented to effectively manage and mitigate environmental impacts associated with a project, operation, or organization. It provides a framework for identifying, assessing, and managing potential environmental risks, as well as ensuring compliance with environmental regulations and standards. The primary goal of the EMP is to promote sustainable practices, minimize adverse environmental effects, and enhance environmental performance.

Background

Based on information obtained from the Michigan Department of Environment, Great Lakes, and Energy (EGLE), one property along the proposed installation route – 505 West Saginaw Highway, Grand Ledge, Michigan (subject property) – required additional historical environmental file review due to multiple underground storage tank (UST) releases near the proposed path of the raw water line installation. While it is unlikely that impacted soil or groundwater will be encountered during installation of the water line, out of an abundance of caution, Fishbeck has prepared this EMP in the event that petroleum constituents of concern are encountered during the installation. The action items detailed in this EMP were developed to mitigate potential environmental and worker safety concerns.

Scope of Work

Fishbeck has prepared contract documents to solicit bids to install an 8-inch-diameter high-density polyethylene (HPDE) raw water line extending from Well 2 to the City of Grand Ledge (City) Iron Removal Plant; the water line is proposed to be installed at a depth of 13 to 15 feet below ground surface (ft bgs) in the area of concern.

This EMP applies to the installation of approximately 145 ft of the north/south section of the raw water line located 75 ft north of Saginaw Highway on De Groff Street in the western right of way (ROW); it bisects Saginaw Highway to the south and travels west along the southern ROW of Saginaw Highway for 100 ft west of Chester Street (see Figure 1).

Subject Property File Review

Fishbeck reviewed the April 24, 2003, *Final Assessment Repor*t (FAR) prepared by Superior Environmental Corporation (Superior). The FAR identified multiple UST releases related to the subject property which were reported to EGLE. Releases of gasoline occurred April 7, 1989 (release ID No. C-0110-89) and October 9, 1989 (release ID No. C-0656-89). Five USTs were removed in 1989 and replaced with three new USTs. During removal of the USTs, additional excavation of impacted soil was conducted in the south and west ROWs of Saginaw Highway and DeGroff Street. A total of 3,619 cubic yards of impacted soil were excavated and disposed at a certified landfill.

Soil Conditions and Characteristics

Based on the FAR, soil conditions and characteristics identified through investigative efforts are as follows:

- 0-25 ft bgs – brown to gray, soft, moist clay containing thin sand seams

- 25-45 ft bgs – fine- to medium-grained sand, well sorted
- 45-48 ft bgs – friable sandstone was encountered

Conclusions by Superior indicate that the majority of impacts were found in the discontinuous thin sand seams in the 0 to 25 ft bgs lithology at the site. Soil impacts identified during the Phase II Environmental Site Assessment investigation and UST removal are summarized in Table 1.

Table 1 – Maximum Soil Analytical Results

Contaminant Compound	CAS Number	Max. Detected Contaminant Concentration	Soil Boring with Max. Conc.	Tier I DW/VIA Criteria (ug/kg)	No. Samples Exceeding Criteria
Benzene	71-43-2	1,500 µg/kg	SB-8 (6-8')	100/5600	8/0
Toluene	108-88-3	11,000 µg/kg	SB-10 (4-6')	16,000/5.3E+5	0/0
Ethylbenzene	100-41-4	6,400 µg/kg	SB-10 (4-6')	1,500/1.1E+5	5/0
Xylenes	1330-20-7	27,000 µg/kg	SB-24 (4-6')	5,600/1.9E+5	4/0
MTBE	1634-04-4	ND µg/kg	ALL	800/4.7E+7	0/0
Naphthalene	91-20-3	1,930 µg/kg	DW-1 (7')	5,500/31,000	0/0
2-Methynaphthalene	91-57-6	3,120 µg/kg	DW-1 (7')	57,000/ID	0/0
1,2,4-TMB	95-63-6	11,600 µg/kg	DW-1 (7')	2,100/56,000	1/0
1,3,5-TMB	108-67-8	2,800 µg/kg	DW-1 (7')	1,800/61,000	1/0
DW = DRINKING WATER VIA = VOLATILIZATION TO INDOOR AIR ID = INSUFFICIENT DATA					

Soil impacts identified in historical Phase II site investigations are not expected to be encountered in the western ROW of DeGroff Street – the proposed location of the 8-inch raw water. Petroleum impacts in soil were observed in the southern ROW of Saginaw Highway at a depth of 5 to 7 ft bgs.

Based on the clay lithology and proposed installation depth (13 to 15 ft bgs) of the water supply line, it is not anticipated that constituents of concern will be encountered.

Groundwater Conditions and Characteristics

The FAR described historical groundwater conditions and characteristics. Historic groundwater was found at a depth of 2 to 9 ft bgs in a shallow perched zone. Prior to 1993, a deeper aquifer was reported at 26 to 28 ft bgs. After a municipal well was put into service in 1993, static water levels in the deeper aquifer were gauged (in 2002 and 2003) at 40 to 46 ft bgs. Historical investigations have determined that impacted groundwater has only been observed in the shallow perched water zone. In 1993,groundwater flow direction was reported to be toward the southwest with a hydraulic gradient of 0.036 feet per foot (ft/ft).

Groundwater impacts identified in the FAR are presented in Table 2.

Table 2 – Maximum Groundwater Analytical Results

Contaminant Compound	CAS Number	Max. Detected Contaminant Concentration	Monitor Well with Max. Conc.	Tier 1 RBSL	Samples Exceeding Criteria
Benzene	71-43-2	464 µg/L	SA-2	5 µg/L (DW)	2
Toluene	108-88-3	322 µg/L	SA-2	790 µg/L(DW)	1
Ethyl-benzene	100-41-4	710 µg/L	SA-2	74 µg/L(DW)	3
Xylenes	1330-20-7	2,550 µg/L	SA-2	280 µg/L(DW)	1
MTBE	1634-04-4	ND	-	40 µg/L(DW)	0
Naphthalene	91-20-3	209 µg/L	SA-2	520 µg/L(DW)	0
2-Methylnaphthalene	91-57-6	90 µg/L	SA-2	260 µg/L(DW)	0
1,2,4-TMB	95-63-6	680 µg/L	SA-2	63 µg/L(DW)	2
1,3,5-TMB	108-67-8	303 µg/L	SA-2	72 µg/L(DW)	2

Groundwater impacts identified in historical Phase II ESA investigations have not been encountered in the western ROW of DeGroff Street or the southern ROW of Saginaw Highway –the proposed location of the raw water line. In February and early March of 2023, Materials Testing Consultants, Inc. conducted soil exploration in the area to a depth of 25 ft; groundwater was not encountered. Absence of groundwater in the shallow, perched aquifer could be attributed to the municipal well which was put into service in 1993.

Soil Cutting/Drilling Mud Collection, Containerizing and Analysis

Soil cuttings/drilling mud will require collection and containerization during horizontal drilling operations in areas that may be impacted with hazardous constituents of concern. These soil cuttings/drilling mud will require careful handling, containerization, and analysis to ensure accurate assessment of contamination levels.

Preparation Considerations

Staffing: Staff selected to conduct the soil cutting/drilling mud sampling require Hazardous Waste Operations and Emergency Response (HAZWOPER) training in accordance with OSHA 29 CFR 1910.120.

Identify EMP Location: Mark out the specific areas along the horizontal drilling path where potential gasoline impacts may occur in soil cuttings/drilling mud. These locations have been identified on Figure 1 based on the historical soil and groundwater assessment activities reported in the FAR and summarized herein.

Obtain Sampling Equipment: Gather the necessary equipment, including clean sampling tools (e.g., shovels), sample containers (preferably pre-cleaned and pre-labeled), personal protective equipment (PPE), and any additional supplies required for proper sample collection.

PPE Requirements: Ensure that personnel involved in sample collection wear appropriate PPE, such as gloves, safety glasses, and dust masks, to minimize exposure to contaminants.

Breathing Zone Monitoring: Arrange for an individual to conduct dedicated breathing zone monitoring. See Section: *Breathing Zone Monitoring Plan for Worker Safety during Horizontal Drilling*.

Soil Cutting/Drilling Mud Collection

Soils extracted from the EMP location will be placed into lined containers (roll-off dumpsters) to avoid contact with the environment. If soils cannot be placed directly into an appropriately lined container and is required to be staged on the ground, the ground surface must be covered with 6-millimeter visqueen prior to staging soils.

Staged soil will be placed in the appropriately lined container(s) within the same work shift in which it was created.

Soil Cutting/Drilling Mud Containerization

Soil Volume Calculations: Determine the volume of soil anticipated to be removed during the horizontal drilling activities in the EMP location.

Soil Cutting Containerization: Based on the calculation of the estimated soil volume, procure an appropriate number of roll-off dumpsters. Dumpsters will require to be lined and must have the ability to be covered in the event of multi-day events and to minimize employee exposure to potentially impacted soils.

Container Staging: Lined dumpsters will require a staging area. The contractor is responsible for arranging a staging area that meets local and state laws and regulations.

Soil/Drilling Mud Sampling

All soil cuttings/drilling mud from locations identified in this EMP will require laboratory analysis prior to landfill disposal. A certified landfill will provide a list of testing required prior to disposal. Sample collection steps include the following:

Soil Cuttings Collection: As soil cuttings/drilling mud are generated during the horizontal drilling process, collect two random grab samples using clean tools.

Drilling Mud Collection: If drilling mud is created during the horizontal drilling, process water will need to be sampled and analyzed separately. It must be decanted from the lined roll off and disposed in accordance with all federal, state, and local laws and ordinances.

Sample Packaging: Place the collected soil cuttings in pre-labeled, airtight sample containers. Each container should be properly sealed to prevent cross-contamination and maintain sample integrity.

Chain of Custody: Document the chain of custody information, including the date, time, location, and individuals involved in the sample collection process. This ensures traceability and accountability throughout the handling and analysis phases.

Sample Handling and Storage

Transportation: Transport the sample containers to a designated laboratory or analysis facility using appropriate measures to prevent spills, leaks, or other incidents during transit.

Storage: If immediate analysis is not possible, store the sample containers in a cool, dry place away from direct sunlight, extreme temperatures, and potential sources of contamination. Follow any specific storage requirements provided by the laboratory or regulatory guidelines.

Laboratory Analysis

Select Accredited Laboratory: Choose a laboratory with accreditation for analyzing soil samples, specifically for gasoline constituents of concern. Ensure the laboratory follows appropriate methods and quality assurance/ quality control protocols.

Sample Submission: Complete the necessary paperwork required by the laboratory, including sample submittal forms, chain of custody documentation, and any specific instructions for analysis. Provide accurate and detailed information about the project, sampling locations, and any specific requirements for the analysis.

Analysis Parameters: Clearly communicate the specific gasoline constituents of concern to be analyzed in the soil cutting samples. This may include hydrocarbon compounds typically found in gasoline, such as benzene, toluene, ethylbenzene, and xylene (BTEX).

Data Interpretation and Reporting

Receive Analytical Results: Upon completion of the analysis, obtain the analytical results from the laboratory. Review the data carefully, ensuring it meets the required detection limits and any regulatory standards or guidelines.

Data Interpretation: Interpret the analytical results in the context of the project's objectives, regulatory requirements, and potential risk assessment. Assess the soil contamination levels based on the gasoline constituents of concern.

Reporting: Prepare a report documenting the sample collection process and laboratory analysis results. Include the laboratory's analytical certificate, chain of custody documentation, and associated data interpretations. Provide the results to the certified landfill to ensure soil cuttings/drilling mud meets the disposal criteria.

Breathing Zone Monitoring Plan for Worker Safety During Horizontal Drilling

The purpose of this EMP is to establish a systematic approach for conducting breathing zone (BZ) monitoring using a photoionization detector (PID) to ensure worker safety during horizontal drilling operations where there is potential exposure to BTEX, methyl-tert butyl ether (MTBE), naphthalene, 2-methylnaphthalene, 1,2,4-trimethylbenzene (TMB), and 1,3,5-TMB. This plan outlines action items to be taken when the permissible exposure limit/c (PEL/TWA), Immediately Dangerous to Life or Health (IDLH), or lower explosive limit (LEL) is exceeded.

Table 3 – Chemical Hazard Evaluation Summary

Chemical Name	PEL/TWA[1]	IDLH[2]	LEL
Benzene	1 ppm	500 ppm	12,000 ppm
Ethylbenzene	100 ppm	800 ppm	11,000 ppm
Toluene	200 ppm	1,000 ppm	12,000 ppm
Xylenes	100 ppm	900 ppm	9,000 ppm
MTBE	40 ppm	2000 ppm	10,000 ppm
Naphthalene	10 ppm	250 ppm	8,000 ppm
2-Methylnaphthalene	N/A	N/A	N/A
1,2,4 - TMB	25 ppm	N/A	N/A
1,3,5 - TMB	N/A	N/A	N/A
Carbon Monoxide	50 ppm	1,200 ppm	N/A
Oxygen	Measure O_2 level - acceptable range 19.5% to 23.5%		

ppm parts per million
N/A not applicable

Breathing Zone Monitoring Procedure

Staffing: Staff selected to conduct the breathing zone monitoring require Hazardous Waste Operations and Emergency Response (HAZWOPER) training in accordance with OSHA 29 CFR 1910.120.

Equipment: Obtain a calibrated PID and four-gas meter. The PID can measure volatile organic compounds (VOCs); the four-gas meter is capable of measuring carbon monoxide and oxygen.

Calibration: Calibrate the PID and the four-gas meter according to the manufacturer's instructions and ensure calibration is up-to-date. Document calibration.

Obtain and record PID and four-gas meter background level with equipment on but not advancing, that is to be used during the subsurface activities. Note weather, wind direction, speed, and temperature. Collect continuous readings for 15 minutes to establish baseline readings.

Sampling Strategy

- Identify and mark the breathing zone locations for workers near the drilling operation.
- Conduct real-time air sampling using the PID in the workers' breathing zone(s).
- Monitor during representative work shifts, focusing on high-risk activities or periods.
- Determine the frequency of monitoring based on the specific work environment, exposure potential, and regulatory requirements.
- Record the results of each monitoring event, including date, time, location, and measured concentrations detected on the PID.
- Maintain accurate records of monitoring results for future reference, compliance reporting, and analysis.

Action Items for Exceeding PEL/TWA

Alerting Workers

- If the measured concentrations of any of the chemicals exceed the PEL/TWA sustained for more than 5 minutes, immediately inform the affected workers.
- Advise workers to take necessary precautions and follow established safety protocols.

Investigation and Control Measures

- Investigate the cause of the elevated concentrations and identify potential sources.
- Implement engineering controls, such as improved ventilation or containment measures, to reduce exposures.
- Review work practices and ensure compliance with established safety procedures.

Medical Evaluation

- Offer medical evaluations, including health assessments, to workers who may have been exposed above the PEL/TWA.
- Provide appropriate medical guidance and follow-up as necessary.

Review and Corrective Actions

- Analyze the monitoring data and review the effectiveness of control measures.
- Take corrective actions to prevent future PEL/TWA exceedances.
- Update the breathing zone monitoring plan and associated protocols, if required.

Action Items for Exceeding IDLH

Immediate Response

- If any of the measured concentrations exceed the IDLH, initiate emergency procedures immediately.
- Safely cease operations
- Evacuate the affected workers to a safe location.
- Provide appropriate medical attention to workers based on the symptoms and severity of exposure.

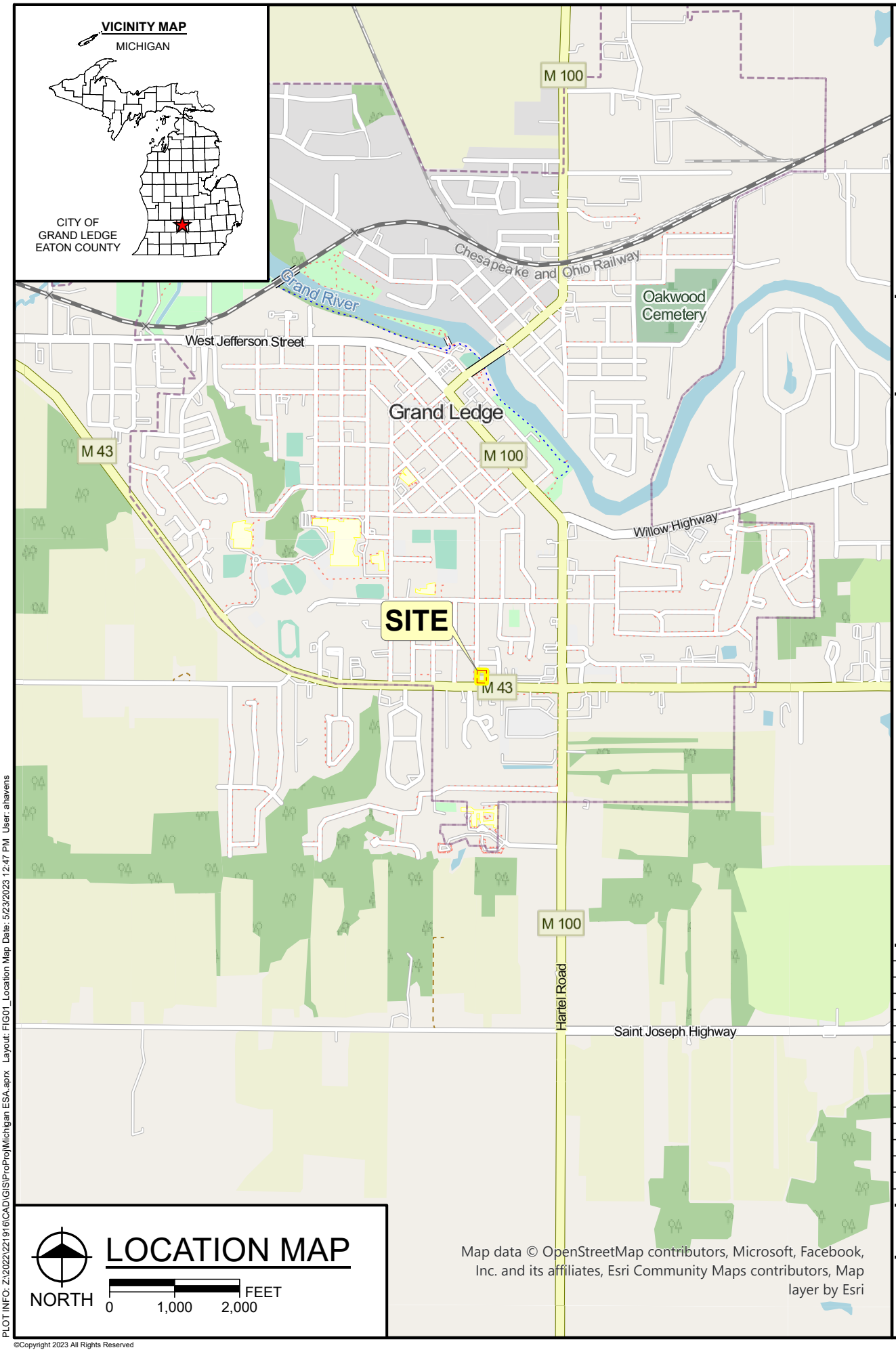
Investigation and Corrective Actions

- Investigate the cause of the IDLH exceedance and take immediate actions to address the situation.
- Implement additional control measures to prevent future IDLH exceedances.
- Conduct a thorough incident investigation to identify lessons learned and prevent recurrence.

Action Items for Exceeding LEL

Immediate Response

- If the measured concentrations of any of the chemicals exceed the LEL, initiate emergency procedures.
- Safely cease operations
- Evacuate the area immediately and ensure the safety of all workers



LOCATION MAP

NORTH

0 1,000 2,000 FEET

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Grand Ledge Tire
505 East Saginaw Highway, Grand Ledge, Michigan
Final Assessment Report

PROJECT NO.
221916

FIGURE NO.
1

PLOT INFO: Z:\2022\221916\CAD\GIS\ProProj\Michigan ESA.aprx Layout: FIG01_Location Map Date: 5/23/2023 12:47 PM User: ahavens

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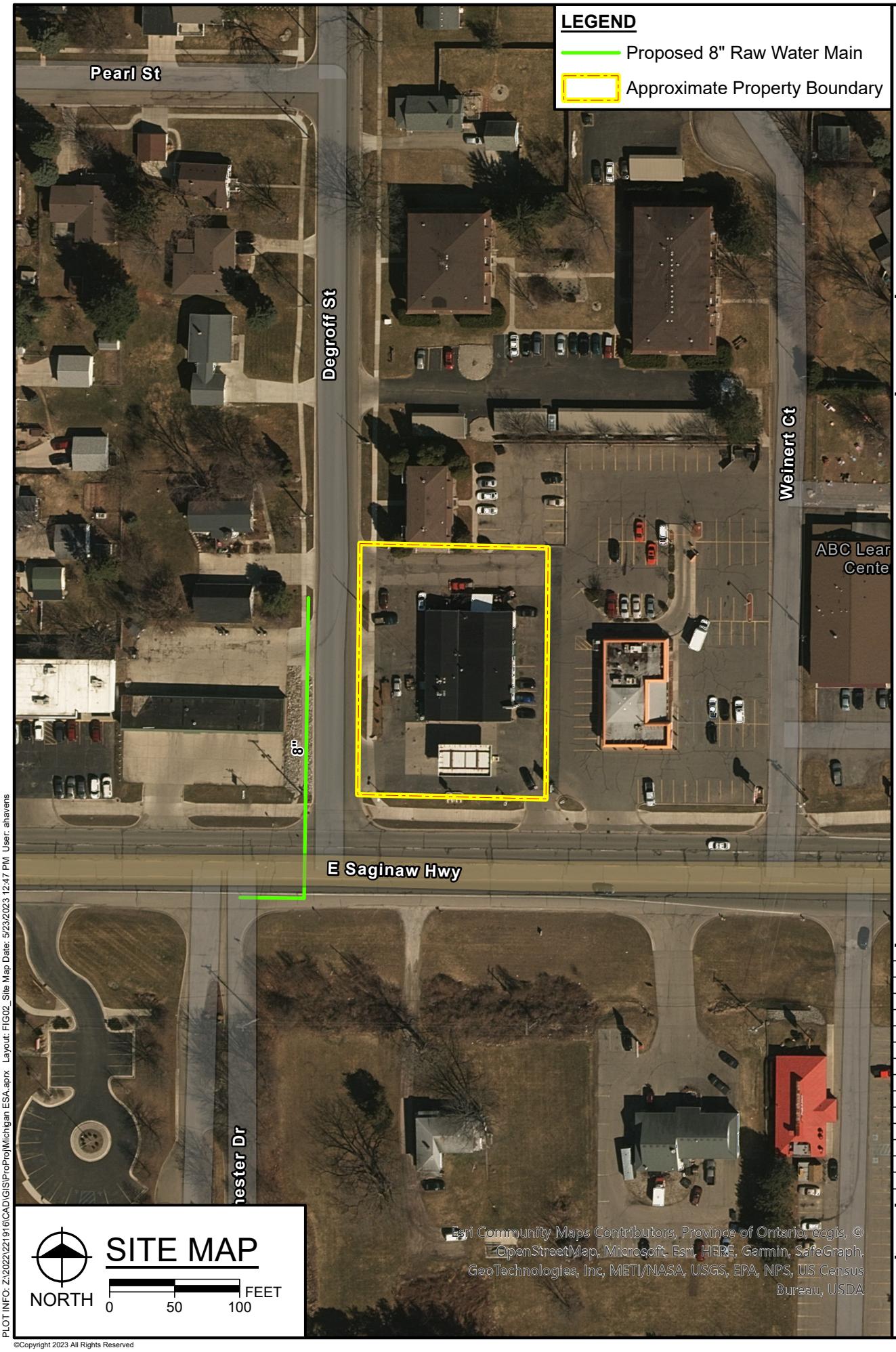

SITE MAP

NORTH

0 50 100 FEET

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505 East Saginaw Highway

Grand Ledge, Michigan

Final Assessment Report

PROJECT NO.
221916

FIGURE NO.
2

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SECTION 31 23 03 – EXCAVATION AND FILL FOR UTILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the furnishing and installation of the major items listed below:
   1. Excavation and trenching in earth and in rock.
   2. Disposal of items from clearing and unsuitable or excess excavated materials.
   3. Complete drainage of excavations.
   4. Temporary or permanent sheeting, bracing and shoring of excavations.
   5. Installation of normal and special foundations, bedding and backfill materials.

1.3 REFERENCES

A. Except as herein specified or as indicated on the Drawings, the work of this Section shall comply with the following:
   1. ASTM Standard Specifications:
      a. D1556 - Density and Unit Weight of Soil In Place by the Sand-Cone Method.
      b. D1557 - Laboratory Compaction Characteristics of Soil Using Modified Effort.
      c. D2321 – Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
      d. D2922 - Density of Soil and Soil-Aggregate in Place by Nuclear Methods.
   2. State DOT Current Standards:
      a. Specifications for Construction.
      b. Standard Plans.

1.4 DEFINITIONS

A. Terms:
   1. Bedding: The material placed around a utility between 4 inches below to 12 inches above the utility the full width of the trench.
   2. Driving Surface: A pavement, curb, or sidewalk.
   3. Excavation:
      a. Removing the following materials from their present location:
         1) Native below-grade material such as soil, rocks, boulders less than 1/2 cubic yard in volume, and buried trees.
         2) Man-made items such as, but not necessarily limited to:
            a) Bituminous and concrete paving.
            b) Curbs.
            c) Riprap.
            d) Head walls.
            e) Underground utilities.
            f) Manholes and catch basins.
            g) Foundations.
            h) Sidewalks.
   4. Extra Earth Excavation: Excavation of native material from below the normal trench bottom.
   5. Foundation Material: The material placed in a trench undercut to replace extra earth excavation.
   6. Hardpan:
      a. Cemented soil layers.
      b. Is not hard clay layers that are not cemented.
   7. Imported Material: Soil material which is purchased by Contractor and hauled onto the Site.
   8. Native Material: Soil and other natural earth materials, except rock, which are existing on the Site prior to the start of Work.
   9. Normal Trench Bottom: The surface of the undisturbed native material at an elevation 4 inches below the bottom of the utility.

10. Pavement: Any combination of subbase, base course and concrete, bituminous or aggregate surface course, including shoulders, placed on a subgrade. Includes roadways, parking areas, driveways, and bituminous seal coat.
11. Rock Excavation:
    a. Excavation of igneous, metamorphic or sedimentary rock or hardpan which cannot be excavated without continuous drilling and blasting or continuous use of a ripper or other special equipment.
    b. Excavation of boulders of 1/2 cubic yard or more in volume.
12. Special Foundations:
    a. Specially constructed systems for support of underground utilities such as timber piling, concrete foundations and surcharge techniques.
    b. Extra earth excavation and placing imported or native materials are not special foundations.
13. Structure: A building, retaining wall, tank, footing, slab, or other similar construction.
14. Suitable Material:
    a. Native material excavated from the trench and approved as backfill by Engineer or independent testing laboratory.
    b. Not used under or within 1 on 1 slope of driving surfaces or structures.
    c. Placed between the top of the bedding or trench backfill as indicated on the Drawings and the bottom of the surface restoration.
15. Trench Backfill:
    a. The material placed between the top of bedding and the bottom of suitable material, the surface restoration or driving surface, as indicated on the Drawings.
    b. Used under and within 1 on 1 slope of driving surfaces or structures.
16. Utility Structure: Manhole, catch basin, valve chamber, junction chamber, water main valve, or other similar utility appurtenance.
17. Other Definitions: Other earthwork terms not defined herein or in the Contract Documents shall be as defined in state DOT Standard Specifications for Construction.
18. Contaminated Material:
    a. Soils or other material which contain chemical contaminants in excess of federal and state standard for use as fill.
    b. Soils which are not to be used for fill.

~~18.~~19. Hazardous Material: Soils or other materials which may contain chemical contaminants in excess of federal and state standards for disposal in a Type II landfill.

1.5 DESIGN AND PERFORMANCE REQUIREMENTS

A. Trench Bottom Suitability:
1. Be responsible for the suitability of the normal trench bottom in supporting the utility, bedding and backfill.
2. Notify Engineer and await Engineer's decision if a possible unsuitable condition exists.
3. Poor dewatering techniques or lack of excess water control shall not be a reason for additional payment for remedial measures.

B. Trench Wall Stability:
1. Be responsible for the trench configuration, including sheeting, shoring and bracing necessary to support trench side walls from collapsing.
2. Be responsible for the structural design and stability of a pipe-laying box if utilized on the Project to prevent trench walls from collapsing.

1.6 QUALITY ASSURANCE

A. Testing: Testing will be performed in accordance with Division 01 Section "Testing Services for Buried Utilities, Roadways, and Site Projects." and the Contractor’s Quality Control Plan.

B. Compaction:
1. Determine density by the modified Proctor method, ASTM D1557.
2. Compact granular trench backfill and bedding to at least 95% maximum density.
3. Compact suitable backfill material to at least 90% maximum density.
4. The first 12 inches of native material at the bottom of utility trenches:
    a. Test for density.
    b. Compact to at least 95% maximum density (modified proctor) if the existing density is below 95% maximum density (MP).

c. Compact clay soil to at least 98% maximum density in accordance with standard proctor ASTM D698, if below 98% maximum density (SP).

1.7 SUBMITTALS

A. Action Submittals: For imported materials:
   1. Source.
   2. State DOT classification.
   3. Sieve Analysis.

1.8 PROJECT CONDITIONS

A. Dust Control:
   1. Use all legal means necessary to control dust on and near the Work and on and near off-site borrow areas if such dust is caused by Contractor's operations during performance of the Work or if resulting from the condition of the Site when earthwork operations are suspended.
   2. Moisten or otherwise treat haul roads, delivery roads, temporary site access roads and other surfaces as required to prevent dust from being a nuisance to the public, neighbors, and concurrent performance of other work on the Site.
   3. Scrape, broom, or vacuum adjacent streets to remove tracked dirt every Friday afternoon, or more as necessary if directed by Engineer. Utilize vacuum if dust from brooming is excessive in opinion of Engineer.

B. Existing Structures, Utility Structures, and Utilities:
   1. Call MISS DIG to locate existing underground utilities prior to starting excavation.
   2. Where utilities, utility structures or structures are encountered which are in active use:
      a. Provide adequate protection for them.
      b. Be responsible for damage to them.
   3. Provide stand-by utility service if temporary removal is necessary for a period exceeding 2 hours.
   4. Where utility service connections to occupied buildings must be temporarily disconnected, give 48 hours notice to the affected occupants of the time and duration of the anticipated shutoff.
   5. Notify Fire Department 48 hours in advance if water main or fire supply line shutoff is required.
   6. Raise, lower, or move underground utilities, utility structures or structures which interfere with the utility or utility structure being constructed as part of this Work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General:
   1. Approval Required: Material shall be subject to the approval of Engineer or independent testing laboratory.
   2. Notification: For approval of imported material, notify Engineer or independent testing laboratory at least 1 week in advance of intention to import material, designate the proposed borrow area, and permit Engineer or independent testing laboratory to sample as necessary from the borrow area for the purpose of making acceptance tests to prove the quality of the material.

B. Material Sources and Uses:
   1. Imported Material:
      a. Foundation material.
      b. Bedding.
      c. Pea stone.
      d. Trench backfill.
   2. Native material unless quantity is not sufficient; then shall be imported material: Suitable material.

C. Foundation Material for Crushed Stone: 1-1/2-inch maximum size.

D. Bedding:
   1. For Pipes Less Than 36 Inches:
      a. MDOT 902 Granular Material Class II modified to 100% passing a 1/2-inch sieve
   2. For Pipes 36 Inches and Larger:
      a. Pea stone bedding to spring line.
      b. Geotextile filter fabric over pea stone.
      c. MDOT Granular Material Class II to 1 foot above pipe.
   3. For Utility Structures:
      a. Sand gravel fill of such gradation that 100% will pass a 1/2-inch sieve and not more than 10% by weight is lost by washing, or
      b. MDOT 902 Granular Material Class II modified to 100% passing a 1/2-inch sieve.

E. Pea Stone: Clean stone with 100% passing a 3/8-inch sieve and 100% being retained on a No. 8 sieve.

F. Trench Backfill: MDOT 902 Granular Material Class II.

G. Suitable Material:
   1. Native Material Which is Used as Backfill:
      a. Exclusive of gray or blue clay, peat, organic matter, or frozen lumps.
      b. Containing no rocks or lumps over 3 inches in greatest dimension.
      c. Having a moisture content such that material is capable of being compacted to 90% maximum density.
   2. MDOT 902 Granular Material Class II if native material is not adequate in opinion of Engineer.

2.2 OTHER MATERIALS

A. Other materials, not specifically described but required for proper completion of the work of this Section, shall be as selected by Contractor subject to the approval of Engineer or independent testing laboratory.

PART 3 - EXECUTION

3.1 GENERAL

A. Excavating, Backfilling and Compacting:
   1. For Utility Structures: In accordance with this Section.

B. Obstructions:
   1. Remove and dispose of buried trees, rocks, boulders, driving surfaces, pipes and the like, as required for the performance of the Work.
   2. Exercise care in excavating around catch basins, inlets and manholes.
   3. Avoid removing or loosening castings.
   4. Repair and replace damaged or displaced castings; remove dirt entering utility structures during the performance of the Work at no additional cost to Owner.

C. Cutting Paved Surfaces and Similar Improvements:
   1. Cut pavement prior to excavating.
   2. Cuts shall be a minimum of 1-foot wider than trench on each side. When the remaining width of paved surface is less than 4 feet, remove the entire paved surface.
   3. Before removing pavement, mark the pavement neatly, paralleling pipe lines and existing street lines. Space the marks the width of the trench.
   4. Concrete:
      a. Pavements: Saw cut if over 3 feet from expansion or construction joint, otherwise remove to joint.
      b. Sidewalks: Remove to joints.
      c. Curb and Gutter: Remove to joints.
   5. Final Surface Course Bituminous: Saw cut joints unless otherwise approved by Engineer.
   6. Do not disturb or damage the adjacent pavement. If the adjacent pavement is disturbed or damaged, remove and replace the damaged pavement.
   7. Contractor may tunnel under curbs that are encountered. Replace curb disturbed by construction.
   8. Dispose of materials removed.

D. Utilities to be Abandoned:
   1. When pipes, conduits, sewers or utility structures are removed from the trench leaving dead ends in the ground, fully plug such ends with brick and mortar.
   2. Entirely remove abandoned utility structures unless otherwise specified or indicated on the Drawings.
   3. Remove from the excavation materials which can be readily salvaged and store on the Site.
   4. Salvageable materials will remain the property of Owner unless otherwise indicated by Owner.

E. Extra Earth Excavation:
   1. If soft material, which in the opinion of Engineer or independent testing laboratory is not suitable, is encountered below the normal trench bottom or below a utility structure Engineer may order the removal of this soft material and its replacement with specified material in order to make a suitable foundation for the construction of the utility or utility structure.
   2. Extra earth excavation made at the order of Engineer will be paid for on the basis of the actual quantity of material excavated. Do not proceed further until instructions are received and necessary measurements made for purposes of establishing additional volume of excavation.
   3. No extra payment will be made if removal is required as a result of poor dewatering techniques.
   4. Special foundations shall be determined on an individual basis by Engineer in cooperation with Contractor, unless otherwise provided in the Contract Documents.

3.2 EXCAVATION AND TRENCHING

A. General:
   1. By open cut from surface unless designated otherwise.
   2. Slope sides of trench adequately for protection of the Work and safety of workers.

B. Maximum Length of Open Trench: 200 feet.

C. Width:
   1. Minimum Clearance on Each Side of Utility:
      a. To 16 Inches Diameter: 8 inches.
      b. Greater Than 16 Inches Diameter: Pipe outside diameter times 1.25 plus 12 inches.
   2. Maximum Width of Trench at Top of Bedding:
      a. Up Through 30-Inch Diameter Utility: 16 inches plus utility diameter.
      b. Greater Than 30-Inch Diameter Utility: 24 inches plus utility diameter.
   3. Maximum Width of Trench at Ground Surface:
      a. Not outside of the property line or easement.
      b. As required for protection of the Work and safety of workers.
      c. Use sheeting, bracing and shoring if required.
   4. Provide sufficient space in the trench to permit the joint to be properly made.

D. Depth:
   1. Excavate to provide the elevations, grades, and depths of cover indicated on the Drawings and herein specified.
   2. The 4 inches of required bedding material below the utility may be omitted if:
      a. Approved by Engineer.
      b. Contractor arranges and pays for testing of the native material.
      c. The native material complies with MDOT 902 Granular Material Class II material, modified so that 100% passes a 1/2-inch sieve.
      d. The material is compacted as specified herein.
   3. Excavate to the normal trench bottom elevation with an accuracy of ± 0.10 feet.

E. Rock Excavation:
   1. Where rock excavation is encountered within the excavation, expose the surface of the rock sufficient to permit adequate measurements to be taken before the rock excavation is started.
   2. Notify Engineer prior to removal if rock is encountered.
   3. No utility shall be within 6 inches of rock.
   4. Blasting:
      a. Only with permission of Engineer and in accordance with laws and regulations applying thereto.
      b. Secure permit if required.
      c. Notify utility and public agencies.
      d. Explosives shall be used with extreme care by experienced workers only.

e. Hours shall be fixed by Engineer.
f. Contractor solely responsible for safety, damage and control of blasting operations.

F. Bedding:
1. Place the bedding material up to 1/8 the height of the utility. Compact as herein specified.
2. Accurately shape the bedding material to fit the pipe shape. Recess the bedding to relieve the pressure on the bell or other projecting utility joint.
3. After laying out the utility, tamp additional bedding in place up to the midpoint of the utility. Use hand-operated compactors to achieve the required compaction.
4. Place additional bedding up to 12 inches above the top of the utility. Use hand operated compactors to achieve required compaction.
5. Place bedding in maximum lifts of 10 inches.
6. No payment shall be made for aggregate or stone bedding when used for Contractor convenience.

G. Trench Backfill:
1. Use backfill material as each Drawing detail indicates and as the material is defined herein.
2. Place backfill in 8 to 10-inch lifts and compact as herein specified. Engineer will consider greater lifts if testing indicates that the required compaction is being achieved.

H. Utility Structures:
1. Place and compact specified bedding below utility structures.
2. Backfill around utility structures shall be of the same type backfill as that required for the trench in accordance with these Contract Documents.
3. Place backfill in 8 to 10-inch lifts and compact as herein specified.

3.3 DISPOSAL OF EXCESS EXCAVATED MATERIAL

A. General: Contractor responsibility and expense.

B. Disposal Sites:
1. Material desired by Owner shall be disposed of by Contractor in the following priority order:
a. At locations designated by the Contract Documents.
b. At locations on or within 2 miles of the Project Site designated by Owner after construction starts.
c. At locations on the Project Site by written arrangement with individual property owners.
d. Owner may choose not to accept certain materials, including but not necessarily limited to, items from clearing, muck, peat, marl and whole or broken man-made items removed by construction.
2. Material not desired by Owner shall be disposed of in a location of the Island determined by Contractor.
3. Disposal of materials shall not violate laws, rules, regulations and the like regarding the filling of flood plains, wetlands and other environmentally sensitive areas.
4. Provide adequate controls to maintain disposal sites in a neat and safe condition by periodic leveling of material, and such other practices as are necessary.
5. Provide soil erosion control measures necessary to prevent soil erosion and sedimentation of wetlands, rivers, ditches, or similar low lying areas.

3.4 EXCESS WATER CONTROL

A. Regulations and Permits: Comply with soil erosion control permit in accordance with Mich. P.A. 451, Part 91 of 1994, the Natural Resource and Environmental Protection Act, and all pertinent rules, laws, and regulations.

B. Unfavorable Weather:
1. Do not place, spread or roll fill material during unfavorable weather conditions.
2. Do not resume operations until moisture content and fill density are satisfactory to Engineer or independent testing laboratory.

C. Pumping and Drainage:
1. Provide, maintain and use at all times during construction adequate means and devices to promptly remove and dispose of water from every source entering the excavations or other parts of the Work.
2. Dewater by means which will ensure dry excavations, preserve final lines and grades, and do not disturb or displace adjacent soil. Use wells, portable pumps, temporary underdrains, or other methods as necessary.

3. Perform Pumping and Drainage:
   a. In such a manner to cause no damage to property or structures and without interference to the rights of the public, owners of private property, pedestrians, vehicular traffic, or the work of other contractors.
   b. In accordance with pertinent laws, rules, ordinances, and regulations.
4. Do not overload or obstruct existing drainage facilities.

D. General:
1. Keep excavations dry during construction.
2. Remove water by use of wells, well points, portable pumps, bailing, drains, underdrains or other acceptable methods.
3. Provide crushed stone or gravel as required to aid dewatering operations.
4. Divert or temporarily reroute existing sewers and drainage of discharge lines to adequate and acceptable outlets during construction. Contractor responsible to ascertain availability of outlets.
5. Divert surface water from entering excavations by construction and maintenance of channels or berms.
6. Sediment traps and other soil erosion control measures shall prevent soil particles from entering any sewer, watercourse or similar conveyance.
7. Protect utilities, utility structures, and structures, existing and new, from hydrostatic uplift.

3.5 DISPOSAL OF CONTAMINATED SOILS

A. General:
1. Soils which are to be excavated within the HAA are suspected of being contaminated.
2. Engineer will determine which soils are potentially contaminated.

B. Potentially Contaminated Soils:
1. Remove from trench.
2. Transport to stockpile area located on Owner's property on [ ].
3. Stockpile on top of an 8 mil PVC liner in accordance with EGLE requirements.
4. Cover with an 8 mil PVC liner in accordance with EGLE requirements.
5. Maintain PVC liner at all times.
6. Keep separate and stockpile separately soils removed from different areas.
7. Engineer will obtain a representative sample of soil from each stockpile and have necessary analytical tests performed as necessary for landfill disposal. Owner will pay for tests.

C. If soils are determined to be contaminated:
1. Transport soils to the to be determined Landfill, located at within 30 miles from Site.
2. Owner will pay landfill disposal fees.

D. If soils are not determined to be contaminated: Grade smooth at stockpile area once all construction has been completed.

E. If soils are determined to be hazardous: Owner will arrange and pay for hazardous material handler to contain and dispose of materials.

~~3.5~~3.6 SHEETING, SHORING AND BRACING EXCAVATIONS

A. General:
1. Furnish, put in place and maintain sheeting, bracing and shoring as may be required to properly support the sides of excavations and to prevent movement of earth which could in any way injure the Work or adjacent property.
2. Exercise care in the removal of sheeting, shoring, bracing and timbering to prevent collapse or caving of the excavation faces being supported and damage to the Work and adjacent property.
3. A pipe-laying box may be used in lieu of sheeting.

B. Sheeting:
1. Do not install by jetting.
2. Remove as backfilling proceeds, unless ordered left in place by Engineer. Use care to fill and compact voids created by removal, especially below mid-height of utility.

3. Sheeting Left in Place:
   a. Requires written approval of Engineer.
   b. Cut off minimum of 2 feet below finished grade.

~~3.6~~3.7 CLEANUP

A. Upon completion of the work of this Section, remove all excess excavated material, trash, and debris resulting from construction operations. Remove equipment and tools. Leave the Site in a neat and orderly condition acceptable to Engineer.

END OF SECTION 31 23 03

SECTION 33 05 30 – UTILITY HORIZONTAL DIRECTIONAL DRILLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the design, furnishing and installation of a pipe crossing under a street or highway, without disturbing the surface, except at entry and exit points.

1.3 REFERENCES

A. Except as herein specified or as indicated on the Drawings, the work of this Section shall comply with the following:
   1. ASTM Standard Specifications:
      a. D2321 – Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and other Gravity-Flow Applications.
      b. D2774 - Underground Installation of Thermoplastic Pressure Pipe.
      c. D3261 - Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
      d. D3350 - Polyethylene Plastics Pipe and Fittings Materials.
      e. F1962 - Guide for Use of Maxi-Horizontal Directional Drilling for Placement of Polyethylene Pipe or Conduit Under Obstacles, Including River Crossings.
   2. AWWA Standards and Manuals:
      a. C104/A21.4 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
      b. C105/A21.5 - Polyethylene Encasement for Ductile-Iron Piping for Water and Other Liquids.
      c. C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings.
      d. C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds for Water or Other Liquids.
      e. C150/A21.50 - Thickness Design of Ductile-Iron Pipe.
      ~~a.~~f. C906 - Standard for Polyethylene (PE) Pressure Pipe and Fittings, 4 In. (100 mm) Through 63 In. (1,575 mm), for Water Distribution and Transmission
      ~~b.~~g. M55 – PE Pipe – Design and Installation.
   3. State DOT Current Standards:
      a. Specifications for Construction.
      b. Standard Plans.
      c. Special Provisions for Horizontal Directional Drilling.

1.4 DESIGN AND PERFORMANCE REQUIREMENTS

A. Minimum Requirements:
   1. The requirements herein and indicated on the Drawings are minimum requirements.
   2. Product pipe shall be minimum internal diameter of 7.25-inches and designed to withstand a minimum internal working pressure of 125 psi at elevation 785 with an additional minimum surge allowance of 50% of the working pressure. External pressures and loads shall not be used to offset internal design pressures.
   3. Select equipment necessary to provide the indicated finished product in the conditions present at the Site.
   4. If, in the opinion of the Contractor, additional geotechnical investigation is required for the design to define the soil conditions, the Contractor shall obtain additional geotechnical information at no cost to the Owner.
   5. No claim for unforeseen condition will be permitted.
   6. Design shall be performed by an engineer licensed in the state that the work occurs.
   7. Review of submittals by Engineer does not relieve Contractor from responsibilities under this specification.

1.5 SUBMITTALS

A. Delegated Design Action Submittals:
1. Calculations and drawings to support and identify the pipe class, installation, thrust and tensile forces, and proposed pipe.
2. Calculations and methods for buoyancy modifications during pull back.
3. Transition fittings at changes in pipe material.
4. Horizontal and vertical alignment drawing of the pilot hole at the same scale as the Drawings.
5. Equipment and materials staging plan, including traffic control.
6. Method for directional drill.
7. Pullback and torque capacity of drill rig(s).
8. Equipment and method for monitoring the location of the drill head.
9. Project workplan and schedule.

B. Informational Submittals:
1. Evidence of current licensure of design engineer in the state in which the work will occur.
2. Provide a log of the following information:
   a. Drill head location.
   b. Axial and torsional loads.
   c. Drilling fluid discharge rate and pressure.
3. Pipe Manufacturer material certifications.
4. Information on drilling fluids to be used.
5. For HDPE pipe, submit pipe Manufacturer's sworn and notarized statements that Contractor has been trained and certified in the handling and joining of the pipe Manufacturer’s materials.

C. Close-Out Submittals:
1. After completion of the directional drilling operation, provide an as-built drawing.
2. Drawing to Include:
   a. Scale: Same as Drawings.
   b. Tabulation of pipeline depth at 25-foot intervals referenced to a stationed alignment located above the pipe.
   c. Tabulation of horizontal alignment points at 25-foot intervals with points being either witnessed to two permanent landmarks or based upon a surveyed and documented coordinate system.

1.6 QUALITY ASSURANCE

A. Installation Personnel Qualifications:
1. Trained and experienced in the use of directional drilling equipment and installation of the materials, for the specific application of Project.
2. Knowledgeable of the design and in down hole drilling, impact of drilling in various geological formations, sensing and recording instrumentation and interpreting computer printout data.
3. Experienced in a minimum of 5 installations of similar or greater complexity and under similar conditions in the last 5 years.
4. The designated Project superintendent shall be present at the Site during work at the Site. Contractor shall not change Project superintendent without written notice to Owner a minimum of 5 working days in advance of the change. Written notice of change shall include detailed information and rationale for staffing change.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Product Pipe:
1. Allowable Pipe Materials: HDPE and Ductile Iron.
2. HDPE Pipe:
   a. Ductile Iron Pipe Size (DIPS), DR 11 (200 psi)
   b. Material Minimums:
      1) High density polyethylene pipe compound molecular weight of 0.941.
      2) Material Designation: PE 4710.
      3) Material Classification: Type III, Class C, Category 5, Grade P34; ASTM D1248.
      4) Cell Classification: ASTM D3350 445574C/E, PE 4710.

5) Manufacturing Standard: ASTM D3350.
6) Pipe shall contain no recycled compounds except that generated in the Manufacturer's own plant from resin of the same specification from the same raw material.
7) Blue Stripe

c. Manufacturers: Poly Pipe, Inc., Performance Pipe, ISCO Industries; or equal.
d. Butt fused joints using equipment and methods in strict accordance with the pipe Manufacturer's recommendations and ASTM D3261 and ASTM D2657.
e. HDPE Fittings:
1) ASTM D3261.
2) Molded or fabricated from polyethylene compound having a cell classification equal to or exceeding the cell classification of the pipe.
3) Molded Fittings: Pressure rated to match the pipe SDR pressure rating to which they are connected.
4) Fabricated Fittings:
a) Made from pipe with a pressure rating at least 25% greater than the pipe to which they are connected.
b) Angle of bends to have tolerance of ± 1% of required angle.
f. Pipe Joining:
1) Pipe to Fitting Joining: Butt fused using equipment and methods in strict accordance with the pipe Manufacturer's recommendations.
2) Joining Segments of Fabricated Fittings: Butt fused using equipment and methods in strict accordance with the pipe Manufacturer's recommendations.
g. Transitions from HDPE Pipe to Other Materials:
1) AWWA C906.
2) Mechanical joint adapter.
3) Obtain Engineer's review.
4) Manufacturers: Phillips Driscopipe, Inc.; Chevron Chemical Company; Plexco; or equal.

3. Ductile Iron Pipe:
a. ANSI/AWWA C150/A21.50 and C151/A21.51.
b. Class: 52.
c. Cement Mortar Lining:
1) ANSI/AWWA C104/A21.4.
2) Double thickness.
d. Meet the requirements of ANSI/NSF Standard 61 and the certification must be stamped on the exterior wall of the pipe.
e. Joints:
1) ANSI/AWWA C111/A21.11.
2) Restrained:
a) 6-Inch Through 24-Inch:
(1) U.S. Pipe: TR Flex Restrained Joint.
(2) American: Flex-Ring Restrained Joint.
f. Lubricant: Provide in accordance with Manufacturer's recommendation.
g. Gasket: Nitrile (NBR).
h. Polyethylene Encasement.

~~3.~~4. Product Pipeline Design: Based on Site conditions, performance criteria, and Contractor's means and methods.
~~4.~~5. Entire pipe line shall meet the same design requirements. Pipe segments with different design criteria will not be allowed without written approval of the Engineer and Owner.

B. Drilling Fluids:
1. Organically inert.
2. Fluid composition shall comply with applicable environmental regulations.
3. Select drilling fluid appropriate for conditions encountered at the Site.

C. Casings:
1. At no additional cost to Owner, install casings as needed for the completion of the work or for protection of existing facilities, utilities, properties, and structures.

D. Detection Wire:
1. Copper wire, solid or braided, with coating to prevent oxidation and deterioration.
2. Minimum Gage: 12 AWG.
3. Secure 2 separate wires to outside of product pipeline.

E. Staging Area Fencing:
   1. Orange, plastic safety fence supported by steel fence posts.
   2. Minimum Height: 4 feet.
   3. Maximum Fence Post Spacing: 8 feet.
   4. No vertical sags greater than 6 inches between posts.

F. Water: Contractor shall be responsible for supplying water required for the work.
   1. Water required for the performance of the work may be obtained through the municipal water supply system. Contractor shall coordinate and pay for temporary connections and usage fees.

PART 3 - EXECUTION:

3.1 LINE AND GRADE

A. Pilot Hole Alignment:
   1. Submit pilot hole alignment data for review prior to reaming and pipe installation.
      a. Alignment data is required to ensure compliance with alignment tolerance performance criteria.
      b. Alignment data submittal review does not relieve the Contractor of responsibility for determining adequate cover for drill fluid containment or other design considerations.
   2. Follow the grade as submitted by Contractor and reviewed by Engineer.
      a. Minimum Cover: 5.5 feet at ends and 10 feet elsewhere along pipeline unless otherwise indicated on the Drawings.
      b. Alignment shall be uniform and not include high points greater than 25% of the pipe's inside diameter.
   3. Lines and grades shall be established in the field by Contractor and reviewed by Engineer.
   4. Provide Engineer with a tabulation and plot of the pilot hole coordinate data at 25-foot intervals referenced to a datum line located above the entrance and exit elevations of the drill.

B. Final Product Pipeline:
   1. Unless otherwise constrained by right-of-way or easement limitations, allowable alignment deviation shall be as follows:
      a. At Locations More Than 50 Feet From Each End:
         1) Horizontal: 5 feet.
         2) Vertical: 5 feet.
      b. At Locations Within 50 Feet From Each End:
         1) Horizontal: 2 feet.
         2) Vertical: 0.5 feet

3.2 STAGING AREAS

A. Drill Staging Area:
   1. Disturb as little area as possible while providing adequate area for workers and equipment.
   2. Keep area neat and orderly.
   3. Install and maintain staging area fencing around perimeter.

B. Pipe Staging Area:
   1. Disturb as little area as possible while providing adequate area for workers and equipment and to string, assemble, and inspect pipe.
   2. Keep area neat and orderly.
   3. Install and maintain staging area fencing around perimeter.
   4. Provide protection of exposed ends of pipe to prevent entry by children and animals.

C. Establish and maintain within right-of-way and easement boundaries identified by Owner.

D. Restore to original grade and condition after completion of work.

3.3 INSTALLATION

A. General:
1. Install pilot hole and pipe in conformance with the reviewed submittals.
2. Minimize subsurface disruption during drilling and pullback operations, including the setting of casings if necessary due to Site conditions or Contractor's operations.
3. During pilot hole installation, notify Engineer immediately if partial or full blockage is encountered.
4. Complete operation as expeditiously as possible.
5. Disposal:
   a. Locate an acceptable site for disposal of drilling fluids and excess soils resulting from drilling operation.
   b. Be responsible for transport of materials to and from the Site to the disposal area as well as disposal costs.
   c. Disposal shall comply with applicable environmental and right-of-way regulations.
6. Install and maintain measures to protect existing utilities and physical features from damage during the Project, including but not limited to damage caused by equipment, settlement, or vibration.

B. Vibration and Noise:
1. Limit vibration to a maximum of 0.2 inches/second on each nearby structure. Provide continual vibration monitoring, maximum of 1 minute data point intervals, on or adjacent to structures affected during activities which may exceed this limit. Provide Engineer with copy of data log.
2. Limit sound levels to a maximum of 67 dB(A) during non-working hours as measured at nearby occupied structures. Sound levels during working hours shall conform to local regulations, or industry standards if no local regulations exist.

C. Heaving and Settlement:
1. Actively monitor for signs of heaving and settlement during drilling operations.
2. Include settling control points on the surfaces or structures as specified below and survey their elevation on a daily basis:
   a. Structures adjacent to the work that may be impacted depending on distance from the drilling operation.
   b. Control points at the intersection of M-43 (W. Saginaw Highway) and Degroff Street including the centerline of M-100 and each edge of the roadway.
   c. Control points at the intersection of M-100 (E. Jefferson Street) and Franklin Street including the centerline of M-100 and each edge of the roadway.
   d. Other points as determined in the field by Engineer.
   e. Other points as required by Contractor.
3. Readings shall be taken with an optical or laser level with an accuracy of ±0.01-foot.

D. Drilling Fluids:
1. Source:
   a. Supply materials required for drilling fluids , including but not limited to water .
2. Inadvertent Returns:
   a. Minimize drilling fluid returns at locations other than drilling entry and exit points.
   b. Immediately clean up inadvertent returns.
   c. Be responsible for paying for costs and obtaining permits required for cleanup efforts.
   d. Be responsible to repair damage caused by inadvertent returns.
   e. Be responsible to repair, clean up, or replace , including temporary water supply required water supply wells affected by inadvertent returns.
3. Containment:
   a. Ensure that equipment is in working order to prevent leakage.
   b. Provide protective measures on the Site to prevent migration of drilling fluids out of the staging areas.
   c. Immediately remove and clean-up drilling fluids outside of the containment areas.
   d. Protect adjacent waterways and storm water facilities from drill fluid contamination.

E. Drill Head Locating:
1. Establish method for determining the location of the advancing drill head.
2. Calculate and plot true vertical depth, horizontal distance and right and left bearing drift.
3. Verify drill head location at least every 25 feet.

F. Pre reaming:
   1. Determine if pre reaming is required.
   2. If prereaming is performed:
      a. Determine required diameter to minimize subsurface disruption and allow unhindered pullback of the product pipeline.
      b. Ensure that annular space around product pipeline is stabilized to prevent settlement.
   3. During the operation, monitor the movement of the reaming head to ensure the hole is free of obstructions along the walls which could reduce the cross section of the installed pipe or which may hinder the pullback of the product pipeline.

G. Placement of Pipe:
   1. Pull Back:
      a. Use appropriate connection equipment between product pipeline and pullback pipe to eliminate transfer of rotational forces to product pipeline.
      b. Support pipe as required to ensure a smooth, freely moving pull back.
      c. Control and limit tensile load on the pipe by devices such as hydraulic pressure regulators or load sensors.
      d. The maximum tensile load on the pipe shall not exceed the maximum allowable load recommended by the pipe Manufacturer.
   2. Detection Wire:
      a. Secure the detection wire to the outside of the pipe to prevent the wire from being dislodged, broken, or stretched during pullback.
      b. Pull detection wire along with the pipe.

3.4 CLEANING

A. Prior to testing, clean pipe using appropriately sized cleaning swabs. Provide containment, filtering, and disposal required for discharge water. Repeat cleaning swab passes as necessary to remove residual soil and drilling fluid contaminants from the pipeline. Multiple swabs may be run in series at the Contractor's option.

3.5 TESTING

A. Pre-Installation Testing:
   1. Conduct low pressure air test prior to pull-back operation.
   2. Restrain piping and components against uncontrolled movement.
   3. Pressurize to a minimum of 4.0 psi and maintained for a minimum of 2 hours.
   4. Check joints by swabbing with a mild soap solution.
   5. Leaking joints shall be removed and pipeline re-joined in accordance with Manufacturer's recommendations.

B. Post Installation Deflection Testing:
   1. Gage Outside Diameter: Not less than 95% of maximum inside pipe diameter with allowance for weld bead thickness.
   2. Allowable Maximum Deflection: 5% of diameter.
   3. Pull Go-No-Go Gage Through Each Section:
      a. Pulled by one person with no mechanical advantage.
      b. Pulled with mechanical advantage:
         1) Utilize pullback force monitoring and recording device capable of continuous recording and minimum force accuracy of 0.5 pounds.
   4. Go-No Go Gage indicates greater than 5% deflection:
      a. Remove and replace section. Undamaged pipe may be reused.
      b. Vibratory Rerounding Device:
         1) Use not permitted.

C. Post Installation Hydrostatic Pressure Testing:
   1. Restrain piping and components against movement.
   2. Fill pipe and ensure removal of any air.
   3. Subject pipe to minimum test pressure of 150% of the system design pressure for a period of 4 hours to expand the pipe, adding water as necessary to maintain the test pressure.
   4. At the end of the 4 hour expansion phase, decrease the test pressure by 10 psi and discontinue adding water.

5. The pipeline must hold the reduced test pressure without the addition of water for a period of 1 hour. Any pressure reduction greater than 5% of the reduced test pressure is considered a failing test.
6. Under no circumstances shall the total time under test exceed 8 hours. If the test is not complete within this time limit, the test section shall be permitted to relax for 8 hours prior to the next test sequence.

D. Complete Pressure, Leak Tests, Disinfection, Flushing, and Bacteriological Testing in accordance with Division 33 “Water Utilities” requirements.

END OF SECTION 33 05 30

SECTION 33 10 00 – WATER UTILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the furnishing and installation of a water distribution system.

1.3 REFERENCES

A. Except as herein specified or as indicated on the Drawings, the work of this Section shall comply with the following:
   1. ASTM Standard Specifications:
      a. A48 - Grey Iron Castings.
      b. A126 - Grey Iron Castings for Valves, Flanges, and Pipe Fittings.
      c. A167 - Standardized Specification for Stainless and Heat-Resistant Chromium-Nickel Steel Plate, Sheet, and Strip.
      d. A240 - Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels.
      e. B62 - Composition Bronze or Ounce Metal Castings.
      f. B88 - Seamless Copper Tube.
      g. C478 - Precast Concrete Manhole Sections.
      h. C923 -Standard Specification for Resilient Connectors Between Reinforced Concrete manhole Structures, Pipes, and Laterals.
      i. D429 - Rubber Property-Adhesion to Rigid Substrates.
      j. D449 - Asphalt Used in Dampproofing and Waterproofing.
      k. D1248 - Polyethylene Plastics Molding and Extrusion Materials.
      l. D1784 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
      m. D1785 - Standardized Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedule 40, 80 and 120.
      n. D2657 – Standard Practice for Heat Fusion Joining of Polyolefin Pipe.
      o. D2774 - Underground Installation of Thermoplastic Pressure Pipe.
      p. D3035 - Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter.
      q. D3139 - Standard Specification for Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals.
      r. D3261 - Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
      s. D3350 - Polyethylene Plastics Pipe and Fittings Materials.
      t. F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
      u. F714 – Standard Specification of Polyethylene (PE) Pipe (SDR-PR) Based on Outside Diameter.
      v. F1668 – Standard Guide for Construction Practices for Buried Plastic Pipe.
      w. F2164 - Standard Practice for Field Leak Testing of Polyethylene (PE) Pressure Piping Systems Using Hydrostatic Pressure.
      x. F2206 – Standards Specification for Fabricated Fittings of Butt-Fused Polyethylene (PE Plastic Pipe, Fittings, Sheet Stock, Plate Stock or Block Stock.
      y. F2620 – Standard Practice for Heat Fusion of Polyethylene Pipe and Fittings.
   2. ANSI/AWWA:
      a. C104/A21.4 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
      b. C105/A21.5 - Polyethylene Encasement for Ductile-Iron Piping for Water and Other Liquids.
      c. C110/A21.10 - Ductile-Iron and Gray-Iron Fittings, 3-inch through 48-inch, for Water and Other Liquids.
      d. C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings.
      e. C150/A21.50 - Thickness Design of Ductile-Iron Pipe.

f. C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds for Water or Other Liquids.
g. C153/A21.53 - Ductile-Iron Compact Fittings, 3-inch through 24-inch (76 mm through 610 mm), and 54-inch through 64-inch (1,400 mm through 1,600 mm) for Water Service.
h. C301 - Prestressed Concrete Pressure Pipe, Steel-Cylinder Type, For Water and Other Liquids.
i. C304 - Design of Prestressed Concrete Cylinder Pipe.

3. AWWA Standards/Manuals:
   a. C502 - Dry-Barrel Fire Hydrants.
   b. C504 - Rubber-Seated Butterfly Valves.
   c. C506 - Backflow Prevention Devices - Reduced Pressure Principle and Double Check Valve Type.
   d. C511 - Reduced Pressure Principle Backflow Prevention Assembly.
   e. C512 - Standard for Air Release, Air/Vacuum and Combination Air Valves for Waterworks.
   f. C515 - Reduced Wall, Resilient Seated Gate Valves for Water Supply Service.
   g. C550 - Standard for Protective Epoxy Interior Coating for Valves and Hydrants.
   h. C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.
   i. C605 - Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water.
   j. C651 - Disinfecting Water Mains.
   k. C700 - Cold Water Meters - Displacement Type, Bronze Main Case.
   l. C701 - Cold Water Meters - Turbine Type for Customer Services.
   m. C702 - Cold Water Meters - Compound Type.
   n. C706 - Direct-Reading, Remote-Registration Systems for Cold Water Meters.
   o. C800 - Underground Service Line Valves and Fittings.
   p. C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4-inch through 12-inch, for Water.
   q. C905 - Polyvinyl Chloride (PVC) Water Transmission Pipe, Nominal Diameters 14-inch through 36-inch
   r. C906 - Standard for Polyethylene (PE) Pressure Pipe and Fittings, 4-inch through 63-inch for Water Distribution.
   s. M23 - PVC Pipe - Design and Installation.
   t. M55 – PE Pipe – Design and Installation.
4. DIPRA - Ductile Iron Pipe Research Association.
5. NFPA – National Fire Protection Association.
6. National Sanitation Foundation (NSF) Standards:
   a. 14 – Plastic Piping System Components and Related Materials.
   b. 60 - Drinking Water Treatment Chemicals.
   c. 61 - Drinking Water System Components.

1.4 DEFINITIONS

A. Abbreviations:
   1. DI - Ductile iron.
   2. HDPE – High Density Polyethylene Pipe.

1.5 SUBMITTALS

A. Action Submittals:
   1. Product Data:
      a. Pipe.
      b. Gaskets.
      c. Hydrants.
      d. Valves.
      e. Thrust control materials.
      f. Corporation stops.
      g. Curb box.
      h. Curb stop.
   2. Procedures: For flushing, pressure testing and chlorinating. Required Information:
      a. Equipment.
      b. Methods.

B. Informational Submittals: Submit Manufacturer's sworn and notarized statements that the materials furnished comply with this Specification.

1.6 QUALITY ASSURANCE

A. Installation Personnel Qualifications:
   1. Trained and experienced in the installation of the materials.
   2. Knowledgeable of the design and the reviewed Shop Drawings.

B. Water Distribution System: Pressure and leak tests.

C. Water Quality: Bacteriological tests.

1.7 PROJECT CONDITIONS

A. Scheduling of Water Shutoffs:
   1. Approval required.
   2. Not to exceed 4 hours, unless otherwise approve by the Engineer.
   3. Standby service may be required by utility agency.
   4. Required Notice:
      a. Fire Department: 48 hours.
      b. Affected Customers: 48 hours.
      c. If local regulations require more notice, the local regulations shall prevail.
   5. Operation of Existing Valves: By Owner's employees only.

B. Contamination of Existing Lines:
   1. Prevent.
   2. Be responsible for all costs of chlorinating and flushing contaminated lines.

PART 2 - PRODUCTS

2.1 PIPE AND FITTING MATERIALS

A. Ductile Iron Pipe:
   1. ANSI/AWWA C150/A21.50 and C151/A21.51.
   2. Class: 52.
   3. Cement Mortar Lining:
      a. ANSI/AWWA C104/A21.4.
      b. Double thickness.
   4. Meet the requirements of ANSI/NSF Standard 61 and the certification must be stamped on the exterior wall of the pipe.
   5. Joints:
      a. ANSI/AWWA C111/A21.11.
      b. Push-on.
      c. Restrained:
         1) 6-Inch Through 24-Inch:
            a) U.S. Pipe: TR Flex Restrained Joint; Field Lok gasket.
            b) American: Flex-Ring Restrained Joint; Fast Grip gasket.
            c) Clow: Super-Lock Restrained Joint.
            d) Griffin Pipe: Snap-lok restrained joint.
            e) Mechanical joint restraint with Megalugs by Ebaa Iron Sales; or equal.
         2) For pipe sizes greater than 24-inch, joints requiring restraint shall be by manufactured restrained joint pipe.
      d. Lubricant: Provide in accordance with Manufacturer’s recommendation.

B. HDPE Pipe:
   1. Ductile Iron Pipe Size (DIPS), DR 11 (200 psi)
   2. Material Minimums:
      a. High density polyethylene pipe compound molecular weight of 0.941.
      b. Material Designation: PE 4710.
      c. Material Classification: Type III, Class C, Category 5, Grade P34; ASTM D1248.
      d. Cell Classification: ASTM D3350 445574C/E, PE 4710.
      e. Manufacturing Standard: ASTM D3350.

f. Pipe shall contain no recycled compounds except that generated in the Manufacturer's own plant from resin of the same specification from the same raw material.

3. Manufacturers: Poly Pipe, Inc., Performance Pipe, ISCO Industries; or equal.
4. Butt fused joints using equipment and methods in strict accordance with the pipe Manufacturer's recommendations and ASTM D3261 and ASTM D2657

C. Detection Wire:
1. Required for all HDPE Pipe
2. Copper wire, solid or braided, with coating to prevent oxidation and deterioration.
3. Minimum Gage: 12 AWG.
4. 2 wires to be placed slightly above the pipe.

D. Fittings:
1. All fittings shall be restrained to pipe.
2. Ductile Iron Fittings:
   a. 6-Inch Through 24-Inch:
      1) ANSI/AWWA C153/A21.53, compact fittings.
      2) Mechanical joints.
      3) 350 psi pressure rating.
      4) Lining:
         a) Standard thickness, cement mortar lining in accordance with AWWA C104.
         b) Fusion bonded epoxy in accordance with AWWA C550, nominal 6-8 Mils.
   b. Joint Restraint for Ductile Iron Fittings to Ductile Iron Pipe:
      1) 6-Inch Through 24-Inch Pipe:
         a) Mechanical joints with Megalugs by Ebaa Iron Sales; or equal.
         b) Push-on joint with stainless steel gripper gasket.
         c) Restrained joints, as indicated on Drawings, to match restrained joint pipe.
      2) 30-Inch Through 48-Inch Pipe: Restrained joints.
3. HDPE Fittings:
   a. ASTM D3261, F2206, and ANSI/AWWA C906.
   b. Molded or fabricated from polyethylene compound having a cell classification equal to or exceeding the cell classification of the pipe.
   c. Molded Fittings: Pressure rated to match the pipe SDR pressure rating to which they are connected.
   d. Fabricated Fittings:
      1) Made from pipe with a pressure rating at least 25% greater than the pipe to which they are connected.
      2) Angle of bends to have tolerance of ± 1% of required angle.
      3) Field fabricated elbows are not permissible
   e. Pipe Joining:
      1) Pipe to Fitting Joining: Butt fused using equipment and methods in strict accordance with the pipe Manufacturer's recommendations.
      2) Joining Segments of Fabricated Fittings: Butt fused using equipment and methods in strict accordance with the pipe Manufacturer's recommendations.
   f. Transitions from HDPE Pipe to Other Materials:
      1) AWWA C906.
      2) Flanged joint adapter.
      3) Obtain Engineer's review.
      4) Manufacturers: Phillips Driscopipe, Inc.; Chevron Chemical Company; Plexco; or equal.

E. Gaskets:
1. ANSI/AWWA C111/A21.11.
2. Styrene Butadiene (SBR).
3. Nitrile (NBR).

2.2 MANUFACTURED UNITS

A. Valves:
1. Manufacturer: EJIW, Clow, US Pipe.
2. Resilient-Seated Gate Valve: AWWA C515:
   a. Nonrising stem.
   b. Wrench nut, 2-inch square.

c. Open left (counter clockwise).
d. Mechanical joint ends.
e. Stem Seal: Buna-N double O-rings.
f. Body and Bonnet: Ductile iron.
g. Wedge: ASTM D429 rubber coated cast or ductile iron.
h. Coating: AWWA C550 fusion-bonded epoxy.
i. Pressure Rating: 200 psi.
j. Stem: Manganese bronze.

3. Valve Boxes:
   a. Manufacturers and Models:
      1) East Jordan Iron Works 8560 with No. 6 base.
      2) Tyler Pipe, 6860 series with #6 base.
      3) Mueller 10357 with No. 160 base.
   b. 5-1/4-inch shaft.
   c. Three section cast iron.
   d. Cast iron lid marked "WATER".
   e. Adjustable:
      1) By means of threaded top and center sections.
      2) Height: 51 inches to 72 inches.

B. Manholes, Vaults and Chambers:
1. General:
   a. Grade Rings: ASTM C478.
   b. Joints:
      1) 1-inch butyl gasket in flexible rope form.
      2) E.Z. Stik, Butyl-Lok; or equal.
   c. Steps:
      1) Manufacturers: MA Industries, PS-1-PF; or equal.
      2) Steel rod, 1/2-inch, encapsulated in copolymer polypropylene.
   d. Casting:
      1) Manufacturers and Models: Neenah, R-1670; East Jordan Iron Works, 1045.
      2) Solid, gasketed, self-sealing cover.
      3) Imprinted on Cover: "WATER".
   e. Connection Between Manhole and Sewer:
      1) Resilient Connector: ASTM C923 and ASTM A167.
      2) 304 stainless steel bands.
      3) KOR-N-SEAL by NPS, Inc.; or equal.
2. Valve Manholes and Air Release Chambers:
   a. Precast Sections: ASTM C478.
   b. Corporation Stops: Mueller, H-15000; Hays Co., 5200.
3. Valve Vaults:
   a. Precast Sections: C 478.
   b. Waterproofing Bituminous: ASTM D449.

PART 3 - EXECUTION

3.1 EARTHWORK

A. In accordance with Division 31 Section “Excavation and Fill for Utilities.”

3.2 LINE AND GRADE

A. Lay pipe to the grades and elevations indicated on the Drawings.

B. Where No Grades are Indicated:
1. Lay pipe with a minimum of 6-1/2 feet of cover below finish grade.
2. Lay pipe at constant uphill and downhill grades to and from air release valves.
3. Avoid high points except at air release valves.

3.3 INSTALLATION

A. General:
1. Except as herein provided or indicated on the Drawings, install in accordance with:
   a. DI: AWWA C600.
   b. HDPE: AWWA M55.
2. Protect all materials before, during and after installation.
3. Install pipe, fittings and appurtenances in accordance with Manufacturer's recommendations except as indicated herein or on the Drawings.
4. Prevent entrance of foreign materials.
5. Restrain pipe, fittings, valves and couplings as required.

B. Placement of Pipe:
1. Bearing: Support entire length of pipe barrel evenly with extra excavation at joints.
2. Bell and Spigot: Clean and lubricate immediately prior to assembly.
3. Jointing:
   a. Mechanical: Tighten evenly to 75 to 90-foot-pounds of torque.
   b. Restrained: Manufacturer's recommended method.
   c. Fusing: Manufacturer’s recommended method.
4. Cutting Pipe:
   a. Power saw.
   b. Ductile Iron and PVC Pipe: Taper cut end by grinding or filing back at least 1/8-inch on a 30 degree bevel.
   c. HDPE: AWWA M55.
5. Thoroughly clean gasket seating surfaces in the socket and on the plain end of the pipe to remove all coating rust and foreign material before use of conductive gasket.

C. Setting Valves and Valve Boxes:
1. Set plumb on 4 inches of compacted 3/8-inch (minimum) crushed stone.
2. Valve Boxes:
   a. Shall not transmit shock to valve.
   b. Plumb over operating nut.
   c. Set cover to finished grade.
   d. Witness.
3. Pressure Tap Sleeve and Valve:
   a. Set at the direction of tapping Subcontractor.
   b. Set and remove tapping machine.

D. Hydrants: Place “Out of Service” placards or labeled bags on pumper nozzle of all hydrants immediately after installation and on all disconnected existing hydrants. Remove after water main is placed in service.

E. Thrust Control:
1. Provide at all fittings.
2. Installation in Accordance With:
   a. Shop Drawings reviewed by Engineer.
   b. Manufacturer's instructions.
3. Restrain all pipe joints within given distance from each fitting (both directions):

Table 1
Length of Restrained Pipe Required

Pipe Diameter	22-1/2 Degree Bends and Less	45 Degree Bends	90 Degrees Bends, Plugs	Tee Run	Tee Branch
6-inch	5-foot	10-foot	20-foot	10-foot	10-foot
8-inch	5-foot	10-foot	25-foot	10-foot	20-foot
10-inch	5-foot	15-foot	35-foot	10-foot	25-foot
12-inch	10-foot	15-foot	40-foot	10-foot	30-foot
16-inch	10-foot	20-foot	50-foot	10-foot	40-foot

F. Placement of Tracer Wire or Pipe Identification Tape:
1. Bury 12 inches above water main.
2. Solder and wrap wire splices.

3. Splice pipe identification tape to ensure continuity of metal foil.
4. Bring wire or tape to surface in valve boxes or as directed by Engineer.

3.4 TESTING AND DISINFECTION

A. Observation: By Engineer.

B. Notification:
1. Pressure Testing: Arrange with Engineer following successful pretesting.
2. Bacteriological Testing: Arrange with Engineer/Owner following successful pressure test.

C. Equipment and Manpower: Provide everything required for testing, disinfection and flushing.

D. Water:
1. To be provided by Owner.
2. Provide temporary connections from Municipal water system to the water main or for hauling water.
3. Provide backflow prevention device.

E. Pressure and Leak Tests for DI and HDPE Pipe:
1. ANSI/AWWA C600.
2. Duration: 2 hours.
3. Pressure:
   a. Maintain 180 pounds per square inch at the average elevation in water main segment being tested.
   b. Do not exceed the pipe's rated test pressure.
4. Water:
   a. To be provided by Owner.
   b. Contractor shall be responsible for providing temporary connections and backflow preventor from Municipal water system for hauling water.
5. Make-Up Water: From measurable source.
6. Maximum Allowable Leakage:

$$L = \frac{SxDxP^{0.5}}{148{,}000} + 0.0078 \text{ gal/hr/in of diameter for each closed valve tested against}$$

L = Leakage in gallons per hour.
S = Length of pipe tested in feet; maximum value 2,000. When length of pipe tested exceeds 2,000 feet, the allowable leakage will be based on 2,000 feet.
D = Pipe diameter in inches.
P = Test pressure: 150 pounds per square inch.

7. Maximum Length of Pipe to be Tested: 2,000 feet, or nearest 2 valves if water on opposite side of valve is not in service.
8. Perform test against tapped cap or plug with a standpipe and not against existing valve if water on opposite side of valve is in service.
9. Repair leaks and repeat tests until acceptable results are achieved.
10. Pressure testing against existing valves not allowed.

F. Disinfection:
1. In Accordance with AWWA C651:
   a. Sodium hypochlorite.
   b. Continuous-feed method.
   c. Calcium hypochlorite granules not required.
   d. Minimum residual 25 parts per million (ppm) initial concentration.
   e. Minimum residual 10 ppm after 24 hours.

G. Flushing:
1. Water main Mainlines: In accordance with AWWA C651.
2. Water Services Into Buildings: In accordance with NFPA 24.
3. Water: Owner supplied.

4. Provide backflow preventor.
5. Velocity:
   a. Water main Mainline: Minimum 3 feet per second in accordance with AWWA.
   b. Water Services (Domestic and Fire Protection): Minimum 10 feet per second in accordance with NFPA.
6. Duration:
   a. Initial: Until entire volume of water in pipeline has been replaced.
   b. Final: Until residual chlorine equals that of adjoining system.
7. Dispose of chlorine residual in accordance with applicable state and local requirements.
8. Disposal location to be inspected by Engineer. If there is any questions that the discharge will harm the environment, apply a reducing agent to the water to neutralize the chlorine to a 1 ppm residual.

H. Bacteriological Testing:
1. In accordance with AWWA C651 and state regulatory agency requirements.
2. Two consecutive bacteriologically safe samples must be taken at 24-hour intervals for each section of pipe tested.
3. Repeat disinfection if bacteriological test fails.
4. Collect Samples from each branch of pipe, and at a maximum spacing of 1,000 feet.
5. Engineer: Transport Samples to lab for testing.
6. Cost of initial and repeat bacteriological lab tests are the responsibility of Contractor.

I. Sequence:
1. Pressure test.
2. Flush.
3. Chlorinate.
4. Flush.
5. Wait 24 hours.
6. Bacteriological sample.
7. Wait 24 hours.
8. Bacteriological sample.
9. Place in service.

END OF SECTION 33 10 00

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SECTION 00 11 13 - ADVERTISEMENT FOR BIDS

City of Grand Ledge

Well 2 Raw Water Main

1. RECEIPT OF BIDS

City of Grand Ledge, the Owner, will receive sealed Bids for construction of the Well 2 Raw Water Main project at the Grand Ledge City Hall, 310 Greenwood Street, Grand Ledge, Michigan 48837 until ~~June 15, 2023~~June 22, 2023 at 10-a.m. , local time. No Bids will be received after that time. Bids will be publicly opened and read aloud at that time and place.

2. SCOPE OF PROJECT

The Work covered by the Contract Documents comprises construction of a raw water main from Well 2, located at 425 East River Street to the City of Grand Ledge Water Treatment Plant at 320 East Saginaw Highway, Grand Ledge, MI 48837. The Work includes the following major items:

- Approximately 5,700 feet of 8-inch HDPE Raw Water Main to be installed utilizing both Horizontal directional drilling and open cut techniques including testing and appurtenances.
- Connection to the existing Well 2 discharge line.
- Connection to the existing water treatment plant raw water system.
- Furnish and install VFD at Well 2.
- Restoration of disturbed areas including bituminous paving, concrete surfacing, and lawn restoration.
- Temporary maintenance of traffic during construction.

3. FINANCING

The Project will be financed with funds provided by the Michigan Department of Environment, Great Lakes, and Energy's Drinking Water State Revolving Fund, and the Contract Documents reflect requirements by that agency.

4. ISSUING OFFICE

Bidding Documents are being issued from Fishbeck's Grand Rapids office. Bidders should direct questions and correspondence to that office.

5. EXAMINATION OF DOCUMENTS

Bidding Documents may be examined at the following locations after May 15, 2023 at 2 p.m., local time.

Fishbeck, 1515 Arboretum Drive, SE, Grand Rapids, Michigan 49546, 616.575.3824.

City of Grand Ledge, 310 Greenwood Street, Grand Ledge, Michigan 48837, 517.627.2194.

Builder's Exchanges: Grand Rapids and Lansing, Michigan.

Dodge Data & Analytics: Hot Springs, AR (formerly known as McGraw-Hill Dodge, Dodge Reports).

A list of entities to whom the Bidding Documents have been issued will be available online at www.fishbeck.com. Click on "Bid Sets/Bidders Lists."

Liberty Mutual Surety
Attention: LMS Claims
PO Box 34526
Seattle, WA 98124
Phone: (206) 473-6210
Fax: (866) 548-6873
Email: HOSCL@libertymutual.com
www.LibertyMutualSuretyClaims.com

Liberty Mutual Insurance Company

BID OR PROPOSAL BOND

KNOW ALL MEN BY THESE PRESENTS, That we, E T MacKenzie Company of 4248 W. Saginaw Hwy Grand Ledge MI 48837 (hereinafter called the Principal) as Principal, and Liberty Mutual Insurance Company, with its principal office in the City of Boston, MA (hereinafter called the Surety), as Surety, are held and firmly bound unto City of Grand Ledge, 310 Greenwood St, Grand Ledge, MI 48837 (hereinafter called the Obligee) in the penal sum of Five Percent of Bid Dollars (5% of Bid) lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors and assigns.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas, the Principal has submitted the accompanying bid dated 6/15/2023 for Well 2 Raw Water Main, Eaton County, MI .

NOW, THEREFORE, if the Obligee shall make any award according to the terms of said bid and the Principal shall enter into a contract with said Obligee in accordance with the terms of said bid and give bond for the faithful performance thereof within the time specified; or if no time is specified within thirty days after the date of said award; or if the Principal shall, in the case of failure so to do, indemnify the Obligee against any loss the Obligee may suffer directly arising by reason of such failure, not exceeding the penalty of this bond, then this obligation shall be null and void; otherwise to remain in full force and virtue.

Signed, sealed and dated: 6/15/2023

E T MacKenzie Company
Principal

By: _____
Michael S. Marks, President

LIBERTY MUTUAL INSURANCE COMPANY INCORPORATED 1912 MASSACHUSETTS

Liberty Mutual Insurance Company

By: _____
Robert G Chapman (Attorney-in-fact)

S-137-Rev.

LMS-20865 11/17

This Power of Attorney limits the acts of those named herein, and they have no authority to bind the Company except in the manner and to the extent herein stated.

Liberty Mutual Insurance Company
The Ohio Casualty Insurance Company
West American Insurance Company

Certificate No: **8208121-013057**

POWER OF ATTORNEY

KNOWN ALL PERSONS BY THESE PRESENTS: That The Ohio Casualty Insurance Company is a corporation duly organized under the laws of the State of New Hampshire, that Liberty Mutual Insurance Company is a corporation duly organized under the laws of the State of Massachusetts, and West American Insurance Company is a corporation duly organized under the laws of the State of Indiana (herein collectively called the "Companies"), pursuant to and by authority herein set forth, does hereby name, constitute and appoint, Cloyd W. Barnes; Curtis M. Peterson; David G. Chapman; Marcia J. Miller; Nathan G. Chapman; Nicole Andries; Robert G. Chapman; Ryan A. Peterson

all of the city of Lansing state of MI each individually if there be more than one named, its true and lawful attorney-in-fact to make, execute, seal, acknowledge and deliver, for and on its behalf as surety and as its act and deed, any and all undertakings, bonds, recognizances and other surety obligations, in pursuance of these presents and shall be as binding upon the Companies as if they have been duly signed by the president and attested by the secretary of the Companies in their own proper persons.

IN WITNESS WHEREOF, this Power of Attorney has been subscribed by an authorized officer or official of the Companies and the corporate seals of the Companies have been affixed thereto this 6th day of June, 2022.

Liberty Mutual Insurance Company
The Ohio Casualty Insurance Company
West American Insurance Company

By: _____
David M. Carey, Assistant Secretary

State of PENNSYLVANIA
County of MONTGOMERY ss

On this 6th day of June, 2022 before me personally appeared David M. Carey, who acknowledged himself to be the Assistant Secretary of Liberty Mutual Insurance Company, The Ohio Casualty Company, and West American Insurance Company, and that he, as such, being authorized so to do, execute the foregoing instrument for the purposes therein contained by signing on behalf of the corporations by himself as a duly authorized officer.

IN WITNESS WHEREOF, I have hereunto subscribed my name and affixed my notarial seal at King of Prussia, Pennsylvania, on the day and year first above written.

Commonwealth of Pennsylvania - Notary Seal
Teresa Pastella, Notary Public
Montgomery County
My commission expires March 28, 2025
Commission number 1126044
Member, Pennsylvania Association of Notaries

By: _____
Teresa Pastella, Notary Public

This Power of Attorney is made and executed pursuant to and by authority of the following By-laws and Authorizations of The Ohio Casualty Insurance Company, Liberty Mutual Insurance Company, and West American Insurance Company which resolutions are now in full force and effect reading as follows:

ARTICLE IV – OFFICERS: Section 12. Power of Attorney.
Any officer or other official of the Corporation authorized for that purpose in writing by the Chairman or the President, and subject to such limitation as the Chairman or the President may prescribe, shall appoint such attorneys-in-fact, as may be necessary to act in behalf of the Corporation to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations. Such attorneys-in-fact, subject to the limitations set forth in their respective powers of attorney, shall have full power to bind the Corporation by their signature and execution of any such instruments and to attach thereto the seal of the Corporation. When so executed, such instruments shall be as binding as if signed by the President and attested to by the Secretary. Any power or authority granted to any representative or attorney-in-fact under the provisions of this article may be revoked at any time by the Board, the Chairman, the President or by the officer or officers granting such power or authority.

ARTICLE XIII – Execution of Contracts: Section 5. Surety Bonds and Undertakings.
Any officer of the Company authorized for that purpose in writing by the chairman or the president, and subject to such limitations as the chairman or the president may prescribe, shall appoint such attorneys-in-fact, as may be necessary to act in behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations. Such attorneys-in-fact subject to the limitations set forth in their respective powers of attorney, shall have full power to bind the Company by their signature and execution of any such instruments and to attach thereto the seal of the Company. When so executed such instruments shall be as binding as if signed by the president and attested by the secretary.

Certificate of Designation – The President of the Company, acting pursuant to the Bylaws of the Company, authorizes David M. Carey, Assistant Secretary to appoint such attorneys-in-fact as may be necessary to act on behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations.

Authorization – By unanimous consent of the Company's Board of Directors, the Company consents that facsimile or mechanically reproduced signature of any assistant secretary of the Company, wherever appearing upon a certified copy of any power of attorney issued by the Company in connection with surety bonds, shall be valid and binding upon the Company with the same force and effect as though manually affixed.

I, Renee C. Llewellyn, the undersigned, Assistant Secretary, The Ohio Casualty Insurance Company, Liberty Mutual Insurance Company, and West American Insurance Company do hereby certify that the original power of attorney of which the foregoing is a full, true and correct copy of the Power of Attorney executed by said Companies, is in full force and effect and has not been revoked.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed the seals of said Companies this 15th day of June, 2023.

By: _____
Renee C. Llewellyn, Assistant Secretary

Not valid for mortgage, note, loan, letter of credit, currency rate, interest rate or residual value guarantees.

For bond and/or Power of Attorney (POA) verification inquiries, please call 610-832-8240 or email HOSUR@libertymutual.com.

SECTION 00 41 43 - BID - UNIT PRICE

Bid of E.T. MacKenzie Company hereinafter called Bidder, organized and existing under the laws of or a resident of the State of Michigan, doing business as a corporation.*

*Insert as applicable: "a corporation", "a partnership" or "an individual".

To the City of Grand Ledge, hereinafter called Owner.

ARTICLE 1 – BID RECIPIENT

1.01 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2 – BIDDER'S ACKNOWLEDGEMENTS

2.01 Bidder accepts all of the terms and conditions of the Advertisement for Bids and Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for 120 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

ARTICLE 3 – BIDDER'S REPRESENTATIONS

3.01 In submitting this Bid, Bidder represents that:

A. Bidder has examined and carefully studied the Bidding Documents, other related data identified in the Bidding Documents, and the following Addenda, receipt of all which is hereby acknowledged:

Addendum Number	Addendum Date
#1	6-6-23

B. Bidder has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

C. Bidder is familiar with and is satisfied as to Laws and Regulations that may affect cost, progress, and performance of the Work.

D. Bidder has carefully studied all:

(1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) that have been identified in the Supplementary Conditions as provided in paragraph 5.03 of the General Conditions, as containing reliable "technical data," and

(2) reports and drawings of Hazardous Environmental Conditions, if any, at the Site that have been identified in the Supplementary Conditions as provided in paragraph 5.06 of the General Conditions as containing reliable "technical data."

E. Bidder has considered the information known to Bidder; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on:

(1) the cost, progress, and performance of the Work;

(2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying the specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents; and

(3) Bidder's safety precautions and programs.

F. Based on the information and observations referred to in Paragraph 3.01.E above, Bidder does not consider that further examinations, investigations, explorations, tests, studies or data are necessary for the determination of this Bid for performance of the Work at the price(s) bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents.

G. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.

H. Bidder has given Engineer written notice of all conflicts, errors, ambiguities or discrepancies that Bidder has discovered in the Bidding Documents, and the written resolution thereof by Engineer is acceptable to Bidder.

I. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work for which this Bid is submitted.

ARTICLE 4 – BIDDER'S CERTIFICATION

4.01 Bidder certifies that:

A. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization or corporation;

B. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid;

C. Bidder has not solicited or induced any individual or entity to refrain from bidding; and

D. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 4.01.D:

(1) "corrupt practice" means the offering, giving, receiving, or soliciting of any thing of value likely to influence the action of a public official in the bidding process;

(2) "fraudulent practice" means an intentional misrepresentation of facts made

(a) to influence the bidding process to the detriment of Owner,

(b) to establish bid prices at artificial non-competitive levels, or

(c) to deprive Owner of the benefits of free and open competition;

(3) "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which to establish bid prices at artificial non-competitive levels; and

(4) "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

ARTICLE 5 – BASIS OF BID

5.01 Bidder will complete the Work in accordance with the Contract Documents for the following unit prices:

Unit Bid Price Schedule					
Item No.	Item Description	Unit	Total Estimated Quantity	Unit Price	Bid Price
1	Cash Allowances - Testing	Dollars	40,000	$1.00	$40,000
2	Mobilization (5% Maximum of Total Bid)	LS	1	70,000	70,000
3	Maintaining Traffic	LS	1	45,000	45,000
4	Preconstruction Video Documentation	LS	1	2,500	2,500
5	Grading, Roadway	Sta	9	4,300	38,700
6	Remove Concrete Curb and Gutter	LF	800	10.60	8,480
7	Remove Concrete Sidewalk and Drive Approaches	SYD	375	28.00	10,500
8	Remove Pavement, Full Depth	SYD	1850	9.30	17,205
9	Remove Sewer Manhole, Valve Chamber or Catch Basin	EA	1	768	768
10	Remove Tree, 6-inch to 18-inch Diameter	EA	2	1,555	3,110
11	Clearing	LS	1	2,567	2,567
12	Remove, Salvage and Reinstall Sign	EA	2	1,415	2,830
13	Soil Erosion and Sedimentation Control	LS	1	49,100	49,100
14	Aggregate Base, 8-inch	SYD	2050	18.50	37,925
15	Curb and Gutter, Concrete	LF	800	63.00	50,400
16	Driveway Approach, HMA	Ton	65	558	36,270
17	Driveway Approach, Concrete, 6 inch	SFT	450	23.15	10,417.50
18	Pavement, HMA 3C	Ton	320	183.15	58,608
19	Pavement, HMA 4C	Ton	160	228.95	36,632
20	Restoration, Lawn	SYD	8500	13.45	114,325
21	Sidewalk Ramp, Concrete, ADA	SFT	120	48.00	5,760
22	Sidewalk, Concrete, 4-inch	SFT	1575	14.45	22,758.75
23	Sidewalk, Concrete, 6-inch	SFT	1350	17.40	23,490
24	Subbase	CYD	700	29.80	20,860
25	Tree, (Ulmus 'New Horizon'), 3-inch	EA	2	3,160	6,320
26	Pavement Markings	LS	1	1,600	1,600
27	Casting, Manhole, Adjust	EA	6	1,390	8,340
28	Casting, Valve Box, Adjust	EA	2	1,286	2,572
29	Valve and Box, Gate, 8-inch	EA	2	4,370	8,740
30	Water Main Fitting, 8-inch, DI	EA	8	914	7,312

Unit Prices have been computed in accordance with Paragraph 13.03 of the General Conditions.

Bidder acknowledges that estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all unit price Bid items will be based on actual quantities, determined as provided in the Contract Documents.

E. T. Mackenzie Company

Bidder (Firm or Corporation Name)

Unit Bid Price Schedule					
Item No.	Item Description	Unit	Total Estimated Quantity	Unit Price	Bid Price
31	Water Main Fitting, 8-inch, HDPE	EA	26	3,293	85,618
32	Water Main Fitting HDPE to DI Transition	EA	2	3,345	6,690
33	Water Main, 8-inch, DI CL 52	LF	60	525	31,500
34	Water Main, 8-inch, HDPE, DIPS, DR 11, Open Cut	LF	2040	319	650,760
35	Water Main, 8-inch, HDPE, DIPS, DR 11, HDD	LF	3520	243	855,360
36	Combination Valve and Chamber	EA	3	42,210	126,630
37	Catch Basin, 4-foot diameter	EA	1	4,500	4,500
38	Storm Sewer, 12-inch, C-76, CL IV	LF	10	710	7,100
39	Cash Allowance - Well 2 Electrical Improvements	Dollars	60,000	$1.00	$60,000
40	Settlement Monitoring	LS	1	31,000	31,000
	TOTAL OF ALL BID PRICES				2,602,248.25

Bid Alternate Items:

Unit Bid Price Schedule					
Item No.	Item Description	Unit	Total Estimated Quantity	Unit Price	Bid Price
Alt-1	Water Main, 8-inch, DI CL 52, HDD	LF	592	464	274,688
Alt-2	Water Main, 8-inch, DI CL 52, NBR Gasket	LF	70	549	38,430
Alt-3	Water Main Fitting, 8-inch, DI, NBR Gasket	EA	4	1,178	4,712
Alt-4	Environmental Monitoring and PPE	LS	1	1,467	1,467
Alt-5	Non-Hazardous Potentially Contaminated Soil Handling and Disposal	CYD	150	155	23,250
Alt-6	Valve and Box, Gate, 12-inch	EA	2	7027	14,054
Alt-7	Water Main Fitting, 12-inch, DI	EA	8	2,557	20,456
Alt-8	Water Main Fitting, 12-inch, HDPE	EA	26	3,443	89,518
Alt-9	Water Main Fitting HDPE to DI Transition, 12-inch	EA	2	7,948	15,896
Alt-10	Water Main, 12-inch, HDPE, DIPS, DR 11, Open Cut	LF	2040	339	689,520.00
Alt-11	Water Main, 12-inch, HDPE, DIPS, DR 11, HDD	LF	3520	300	1,056,000
Alt-12	Combination Valve and Chamber, 12-inch Pipe	EA	3	62,000	186,000
Alt-13	Water Main, 12-inch, DI CL 52, HDD	LF	592	651	385,392
Alt-14	Water Main, 12-inch, DI CL 52, NBR Gasket	LF	70	590	41,300
Alt-15	Water Main Fitting, 12-inch, DI, NBR Gasket	EA	4	1,935	7,740
	TOTAL OF ALL ALTERNATE BID PRICES				

2,848,423.00

Unit Prices have been computed in accordance with Paragraph 13.03 of the General Conditions.

Bidder acknowledges that estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all unit price Bid items will be based on actual quantities, determined as provided in the Contract Documents.

E. T. MacKenzie Company

Bidder (Firm or Corporation Name)

ARTICLE 6 – TIME OF COMPLETION

6.01 Bidder agrees that the Work will be substantially complete no later than October 18, 2024 and completed and ready for final payment in accordance with paragraph 15.06 of the General Conditions on or before November 1, 2024

6.02 Bidder agrees that the Work will be substantially complete within 105 calendar days once work begins on site.

6.03 Bidder agrees that work will not take place during specified events as outlined in the Summary of Work.

6.04 Bidder accepts the provisions of the Agreement as to liquidated damages.

6.05 Bidder acknowledges that the Work will not begin until the Funding Agency contracting requirements have been met and a contract is executed. It is anticipated that this will occur on August 28, 2023, but subject to change as determined by the Funding Agency.

ARTICLE 7 – ATTACHMENTS TO THIS BID

7.01 The following documents are submitted with and made a condition of this Bid:

A. Required Bid security.

B. Evidence of authority to sign Bid, if Bid is submitted by a corporation, partnership or joint venture;

C. Certification Regarding Debarment, Suspension, and Other Responsibility Matters.

ARTICLE 8 – DEFINED TERMS

8.01 The terms used in this Bid with initial capital letters have the meanings indicated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

ARTICLE 9 – BID SUBMITTAL

9.01 This Bid is submitted by:

SUBMITTED on June 22, 2023
Date*

4243 W Saginaw Hwy
Business Street Address*

Grand Ledge MI 48837
City, State, and Zip*

517-627-8408
Telephone Number*

517-627-4470
Facsimile Number*

mmarks@mackenziecc.com
E-mail Address*

BY: C. T. MacKenzie Company
Name of Bidder*

Signature

Michael S. Marks, President
Name and Title of Signatory*

*Typed or printed in ink.

END OF SECTION 00 41 43

E. T. MacKenzie Company Minutes of the Special
Meeting of the Board of Directors

The Special Meeting of the Directors of E. T. MacKenzie Company was held at the corporate office of the corporation at 4248 W. Saginaw Hwy in the Township of Oneida, County of Eaton, State of Michigan, on December 21, 2015, at 11:30 a.m., pursuant to a written waiver of notice of such meeting signed by the Corporate Secretary affixing the time, date, and place of said meeting.

Michael S. Marks, Thomas E. MacKenzie, and Stephanie MacKenzie, the directors and shareholders of the corporation, were present. Upon motion duly made, seconded and carried, the following resolution was adopted:

> RESOLVED, that Michael S. Marks, President, Thomas E. MacKenzie, Vice-President, and Stephanie MacKenzie, Secretary, of the corporation, are hereby authorized for and on behalf of said corporation to act for the business in all matters connected with its contracting business and to sign all contract related documents, including bids, bid bonds, contracts and contract change orders.

There being no further business to be transacted, the meeting was, upon motion duly made, seconded and carried, adjourned.

Dated: December 21, 2015

Stephanie MacKenzie,
Director, Shareholder, and Secretary
of the Meeting

Certification Regarding
Debarment, Suspension, and Other Responsibility Matters

The prospective participant certifies, to the best of its knowledge and belief, that it and its principals:

(1) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in transactions under federal nonprocurement programs by any federal department or agency;

(2) Have not, within the three year period preceding the proposal, had one or more public transactions (federal, state, or local) terminated for cause or default; and

(3) Are not presently indicted or otherwise criminally or civilly charged by a government entity (federal, state, or local) and have not, within the three year period preceding the proposal, been convicted of or had a civil judgment rendered against it:

(a) For the commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public transaction (federal, state, or local) or a procurement contract under such a public transaction;

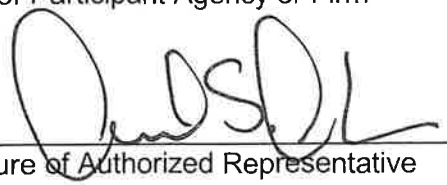
(b) For the violation of federal or state antitrust statutes, including those proscribing price fixing between competitors, the allocation of customers between competitors, or bid rigging; or

(c) For the commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property.

I understand that a false statement on this certification may be grounds for the rejection of this proposal or the termination of the award. In addition, under 18 U.S.C. §1001, a false statement may result in a fine of up to $10,000 or imprisonment for up to five years, or both.

Michael S Marks, President
Name and Title of Authorized Representative

E. T. Mackenzie Company
Name of Participant Agency or Firm



Signature of Authorized Representative

6/22/23
Date

☐ I am unable to certify to the above statement. Attached is my explanation.

12-inch Option Bid Tabulation

Project Name: Grand Ledge Raw Water Main Well 2
Project Location: Grand Ledge Michigan
Project Number: 221916
Bid Opening Date: Thursday, June 22, 2023
Time: 10:00 a.m.
Estimate By: Michael Berrevoets

				ENGINEER'S ESTIMATE		Apparent Low Bid E.T. MacKenzie Company	
Item No.	Item Description	Unit	Est Quantity	Unit Price	Amount	Unit Price	Amount
1	Cash Allowances - Testing	Dollars	40,000	$1.00	$40,000.00	$1.00	$40,000.00
2	Mobilization (5% Maximum of Total Bid)	LS	1	$83,000.00	$83,000.00	$70,000.00	$70,000.00
3	Maintaining Traffic	LS	1	$60,000.00	$60,000.00	$45,000.00	$45,000.00
4	Preconstruction Video Documentation	LS	1	$10,000.00	$10,000.00	$2,500.00	$2,500.00
5	Grading, Roadway	STA	9	$7,500.00	$67,500.00	$4,300.00	$38,700.00
6	Remove Concrete Curb and Gutter	LF	800	$15.00	$12,000.00	$10.60	$8,480.00
7	Remove Concrete Sidewalk and Drive Approaches	SYD	375	$12.00	$4,500.00	$28.00	$10,500.00
8	Remove Pavement, Full Depth	SYD	1850	$10.00	$18,500.00	$9.30	$17,205.00
9	Remove Sewer Manhole, Valve Chamber or Catch Basin	EA	1	$2,000.00	$2,000.00	$768.00	$768.00
10	Remove Tree, 6-inch to 18-inch Diameter	EA	2	$1,200.00	$2,400.00	$1,555.00	$3,110.00
11	Clearing	LS	1	$5,000.00	$5,000.00	$2,567.00	$2,567.00
12	Remove, Salvage and Reinstall Sign	EA	2	$450.00	$900.00	$1,415.00	$2,830.00
13	Soil Erosion and Sedimentation Control	LS	1	$35,000.00	$35,000.00	$49,100.00	$49,100.00
14	Aggregate Base, 8-inch	SYD	2050	$25.00	$51,250.00	$18.50	$37,925.00
15	Curb and Gutter, Concrete	LF	800	$30.00	$24,000.00	$63.00	$50,400.00
16	Driveway Approach, HMA	TON	65	$150.00	$9,750.00	$558.00	$36,270.00
17	Driveway Approach, Concrete, 6 inch	SFT	450	$9.50	$4,275.00	$23.15	$10,417.50
18	Pavement, HMA 3C	TON	320	$125.00	$40,000.00	$183.15	$58,608.00
19	Pavement, HMA 4C	TON	160	$135.00	$21,600.00	$228.95	$36,632.00
20	Restoration, Lawn	SYD	8500	$6.00	$51,000.00	$13.45	$114,325.00
21	Sidewalk Ramp, Concrete, ADA	SFT	120	$75.00	$9,000.00	$48.00	$5,760.00
22	Sidewalk, Concrete, 4-inch	SFT	1575	$6.50	$10,237.50	$14.45	$22,758.75
23	Sidewalk, Concrete, 6-inch	SFT	1350	$8.00	$10,800.00	$17.40	$23,490.00
24	Subbase	CYD	700	$30.00	$21,000.00	$29.80	$20,860.00
25	Tree, (Ulmus 'New Horizon'), 3-inch	EA	2	$800.00	$1,600.00	$3,160.00	$6,320.00
26	Pavement Markings	LS	1	$3,500.00	$3,500.00	$1,600.00	$1,600.00
27	Casting, Manhole, Adjust	EA	6	$750.00	$4,500.00	$1,390.00	$8,340.00
28	Casting, Valve Box, Adjust	EA	2	$400.00	$800.00	$1,286.00	$2,572.00
29	Valve and Box, Gate, 8-inch	EA	**0**	$3,200.00	$0.00	$4,370.00	$0.00
30	Water Main Fitting, 8-inch, DI	EA	**6**	$1,300.00	$7,800.00	$914.00	$5,484.00
31	Water Main Fitting, 8-inch, HDPE	EA	**0**	$900.00	$0.00	$3,293.00	$0.00
32	Water Main Fitting HDPE to DI Transition	EA	**0**	$3,200.00	$0.00	$3,345.00	$0.00
33	Water Main, 8-inch, DI CL 52	LF	60	$225.00	$13,500.00	$525.00	$31,500.00
34	Water Main, 8-inch, HDPE, DIPS, DR 11, Open Cut	LF	**0**	$145.00	$0.00	$319.00	$0.00
35	Water Main, 8-inch, HDPE, DIPS, DR 11, HDD	LF	**0**	$165.00	$0.00	$243.00	$0.00
36	Combination Valve and Chamber	EA	**0**	$30,000.00	$0.00	$42,210.00	$0.00
37	Catch Basin, 4-foot diameter	EA	1	$3,500.00	$3,500.00	$4,500.00	$4,500.00
38	Storm Sewer, 12-inch, C-76, CL IV	LF	10	$150.00	$1,500.00	$710.00	$7,100.00
39	Cash Allowance - Well 2 Electrical Improvements	DOLLARS	60,000	$1.00	$60,000.00	$1.00	$60,000.00
40	Settlement Monitoring	LS	1	$60,000.00	$60,000.00	$31,000.00	$31,000.00
	Construction Cost Subtotal (calculated)				**$750,412.50**		**$866,622.25**

Bid Alternate Items				ENGINEER'S ESTIMATE		E.T. MacKenzie Company	
Item No.	Item Description	Unit	Quantity	Unit Price	Amount	Unit Price	Amount
Alt-1	Water Main, 8-inch, DI CL 52, HDD	LF	0	$245.00	$0.00	$464.00	$0.00
Alt-2	Water Main, 8-inch, DI CL 52, NBR Gasket	LF	0	$250.00	$0.00	$549.00	$0.00
Alt-3	Water Main Fitting, 8-inch, DI, NBR Gasket	EA	0	$1,600.00	$0.00	$1,170.00	$0.00
Alt-4	Environmental Monitoring and PPE	LS	0	$15,000.00	$0.00	$1,467.00	$0.00
Alt-5	Non-Hazardous Potentially Contaminated Soil Handling and Disposal	CYD	150	$150.00	$22,500.00	$155.00	$23,250.00
Alt-6	Valve and Box, Gate, 12-inch	EA	2	$5,500.00	$11,000.00	$7,027.00	$14,054.00
Alt-7	Water Main Fitting, 12-inch, DI	EA	**2**	$1,600.00	$3,200.00	$2,557.00	$5,114.00
Alt-8	Water Main Fitting, 12-inch, HDPE	EA	26	$1,200.00	$31,200.00	$3,443.00	$89,518.00
Alt-9	Water Main Fitting HDPE to DI Transition, 12-inch	EA	2	$4,000.00	$8,000.00	$7,948.00	$15,896.00
Alt-10	Water Main, 12-inch, HDPE, DIPS, DR 11, Open Cut	LF	2040	$180.00	$367,200.00	$338.00	$689,520.00
Alt-11	Water Main, 12-inch, HDPE, DIPS, DR 11, HDD	LF	3520	$200.00	$704,000.00	$300.00	$1,056,000.00
Alt-12	Combination Valve and Chamber, 12-inch Pipe	EA	3	$40,000.00	$120,000.00	$62,000.00	$186,000.00
Alt-13	Water Main, 12-inch, DI CL 52, HDD	LF	0	$285.00	$0.00	$651.00	$0.00
Alt-14	Water Main, 12-inch, DI CL 52, NBR Gasket	LF	0	$290.00	$0.00	$590.00	$0.00
Alt-15	Water Main Fitting, 12-inch, DI, NBR Gasket	EA	0	$1,900.00	$0.00	$1,935.00	$0.00
				Subtotal	**$1,267,100.00**	***Subtotal***	**$2,079,352.00**
				Total	**$2,017,512.50**	***Total***	**$2,945,974.25**

A RESOLUTION TO TENTATIVELY AWARD
A CONSTRUCTION CONTRACT FOR WATER SYSTEM IMPROVEMENTS

WHEREAS, the City of Grand Ledge *(legal name of applicant)* wishes to construct a new twelve-inch raw water main from Well No. 2 in Jaycee Park to the Iron Removal Plant; and

WHEREAS, the water system improvements project formally adopted by EGLE on November 16, 2022, *(date of final project plan adoption)* will be funded through the state of Michigan's Drinking Water State Revolving Fund (DWSRF) program; and

WHEREAS, the City of Grand Ledge *(legal name of applicant)* has sought and received construction bids for the proposed improvements and has received a low bid in the amount of $2,945,974.25 from E.T. MacKenzie Company *(name of the contractor)*; and

WHEREAS, the City's engineer, Fishbeck has recommended awarding the contract to the low bidder.

NOW THEREFORE BE IT RESOLVED, that the City of Grand Ledge *(legal name of applicant)* tentatively awards the contract for construction of the proposed water system improvements project to E.T. MacKenzie Company *(name of the contractor)*, contingent upon successful financial arrangements with the DWSRF.

Yeas:	Gillespie, Jancek, Lantz, Logel, MacDowell, Mulder, Willems
Nays:	none
Abstain:	none
Absent:	none

I certify that the above Resolution was adopted by the City of Grand Ledge *(the governing body of the applicant)* on July 10, 2023.

BY: Gregory L. Newman, City Clerk
Name and Title *(please print or type)*

07/11/2023
01:35 PM EDT

Signature Date

ADDENDUM
PAGE 1 OF 2

OWNER:	City of Grand Ledge City Hall 310 Greenwood Street Grand Ledge, MI 48837
ENGINEER:	Fishbeck 1515 Arboretum Drive, SE Grand Rapids, MI 49546
DRAWING REVISION NO.:	A1
ISSUED HEREWITH:	
SPECIFICATION SECTIONS:	00 11 13, 00 41 43, 01 21 13, 01 22 00, 01 35 46, 31 23 03, 33 05 30, 33 10 00
SHEETS:	Full Plan Set with changes on sheets 4, 11, 12, 14, 15, 16, and 23
BIDS DUE:	**June 22, 2023 at 10:00 a.m**.

This Addendum is issued to all Bid Set Holders, is a part of the Contract Documents, and modifies the previously issued Bidding Documents. Acknowledge receipt of this Addendum in the space provided on the Bid form; failure to do so may result in rejection of the Bid.

ITEM NO. 1:
Section: 00 11 13 – Advertisement For Bids

A. Bids due date extended 1 week. Bids Due June 22, 2023 at 10:00 a.m.

ITEM NO. 2:
Section: 00 41 43 – Bid – Unit Price (reissued)
01 22 00 – Unit Prices – Measurement and Payment (reissued)
01 35 46 – Contaminated Soil and Groundwater Procedures (issued)
31 23 03 – Excavation and Fill for Utilities (reissued)
33 05 30 – Utility Horizontal Directional Drilling (reissued)
33 10 00 – Water Utilities (reissued)

A. Potential contamination that could negatively impact the HDPE water main material may exist between stations 8+50 and 13+00. The Engineer is completing additional testing and sampling to determine whether the contamination exists at the proposed water main location and elevation. Test results will not be available until shortly after Bids are due. If potential contamination is confirmed to exist in this area the pipe material will be changed to Ductile Iron with NBR gaskets. Items are added to the bid form as an alternate for pricing purposes in case the change is necessary.
   1. HDD "A" (Station 9+20 to 15+12) would be installed utilizing HDD methods with ductile iron pipe and NBR gaskets.
   2. Open cut HDPE from Station 8+50 to 9+20 would change to Open Cut Ductile Iron with NBR gaskets.
   3. Fittings would change from HDPE fused to ductile Iron with NBR Gaskets.
   4. Additional "Water Main Fitting HDPE to DI Transition would be necessary and paid at Unit Bid Price Schedule already included in original bid.
   5. Environmental monitoring and worker PPE would be necessary if contamination is present.
   6. Non-Hazardous potentially contaminated soil handling and disposal would be necessary if contamination is present.

B. Section revisions/additions:
   1. Bid – Unit Price is reissued to include added alternate items.
   2. Unit Prices – Measurement and Payments reissued to include new pay items.
   3. Contaminated Soil and Groundwater Procedures is issued to be included in the Project.
   4. Excavation and Fill for Utilities is reissued to include requirements for handling and disposal of potentially contaminated materials.
   5. Utility Horizontal Direction Drilling reissued to include ductile iron pipe and gasket material requirements.

6. Water Utilities is reissued to include NBR gaskets.

ITEM NO. 3:
Section: 01 21 13 – Cash Allowances (reissued)
00 41 43 – Bid – Unit Price (reissued)

A. The Cash Allowance for Well 2 Electrical improvements is changing from $100,000 to $60,000 after receiving additional information.
B. The Bid – Unit Price is reissued to change Item 39 quantity.

ITEM NO. 4:
Section: Section 00 41 43 – Bid – Unit Price (reissued)

A. The Owner is considering the option to increase the size of the water main from 8-inch to 12-inch to accommodate a future potential well and the flow that would be added to this raw water main. Items have been added to the Bid – Unit Price for pricing purposes. Pay items have been changed from 8-inch to 12-inch. Specifications remain the same with the increase in pipe diameter. The “Combination Valve” model remains the same, however the pipe size in the valve chamber would be increased from 8-inch to 12-inch.
B. The new alternate pay items for Addendum Item No. 1 related to the potentially contaminated material are also included for bidding with the upsize from 8-inch to 12-inch.

ITEM NO. 5:
Sheet: Section 01 22 00 – Unit Prices – Measurement and Payment (reissued)

A. Pay item for Soil Erosion and Sedimentation Control adjusted to clearly include that the Contractor is responsible for applying for and obtaining the Soil Erosion Permit from the local Enforcing Agent.

ITEM NO. 6:
Sheets: 4 – Well 2 Raw Water Main – Raw Water Main Alignment (reissued)
11 – Degroff Street – POB to STA 9+00 – Raw Water Main (Reissued)
12 – Degroff Street – STA 9+00 to STA 18+00 – Raw Water Main (Reissued)
14 – Degroff Street – STA 26+00 to STA 34+00 – Raw Water Main (Reissued)
15 – Degroff Street – STA 33-00 to STA 37+00 – Raw Water Main (Reissued)
16 – Degroff and Franklin Street – STA 37-00 to STA 44+00 – Raw Water Main (Reissued)
23 – M-43 Water Main Crossing Details (Reissued)

A. Water main alignment alterations and notes changed in accordance with EGLE Part 399 permit review. Changes are relatively minor and identified on the reissued Sheets with Addendum 1 clouding.

END OF ADDENDUM

SECTION 00 11 13 - ADVERTISEMENT FOR BIDS

City of Grand Ledge

Well 2 Raw Water Main

1. RECEIPT OF BIDS

City of Grand Ledge, the Owner, will receive sealed Bids for construction of the Well 2 Raw Water Main project at the Grand Ledge City Hall, 310 Greenwood Street, Grand Ledge, Michigan 48837 until ~~June 15, 2023~~June 22, 2023 at 10- a.m. , local time. No Bids will be received after that time. Bids will be publicly opened and read aloud at that time and place.

2. SCOPE OF PROJECT

The Work covered by the Contract Documents comprises construction of a raw water main from Well 2, located at 425 East River Street to the City of Grand Ledge Water Treatment Plant at 320 East Saginaw Highway, Grand Ledge, MI 48837. The Work includes the following major items:

- Approximately 5,700 feet of 8-inch HDPE Raw Water Main to be installed utilizing both Horizontal directional drilling and open cut techniques including testing and appurtenances.
- Connection to the existing Well 2 discharge line.
- Connection to the existing water treatment plant raw water system.
- Furnish and install VFD at Well 2.
- Restoration of disturbed areas including bituminous paving, concrete surfacing, and lawn restoration.
- Temporary maintenance of traffic during construction.

3. FINANCING

The Project will be financed with funds provided by the Michigan Department of Environment, Great Lakes, and Energy's Drinking Water State Revolving Fund, and the Contract Documents reflect requirements by that agency.

4. ISSUING OFFICE

Bidding Documents are being issued from Fishbeck's Grand Rapids office. Bidders should direct questions and correspondence to that office.

5. EXAMINATION OF DOCUMENTS

Bidding Documents may be examined at the following locations after May 15, 2023 at 2 p.m., local time.

Fishbeck, 1515 Arboretum Drive, SE, Grand Rapids, Michigan 49546, 616.575.3824.

City of Grand Ledge, 310 Greenwood Street, Grand Ledge, Michigan 48837, 517.627.2194.

Builder's Exchanges: Grand Rapids and Lansing, Michigan.

Dodge Data & Analytics: Hot Springs, AR (formerly known as McGraw-Hill Dodge, Dodge Reports).

A list of entities to whom the Bidding Documents have been issued will be available online at www.fishbeck.com. Click on "Bid Sets/Bidders Lists."

6. OBTAIN BIDDING DOCUMENTS

Bidding Documents may be obtained (ordered) online, go to www.fishbeck.com, click on “Bid Sets/Bidders Lists.” Costs for electronic downloads is $1.25 per file, plus tax. Cost for printed sets of Bidding Documents is $60.00 plus tax and shipping. Individuals/companies that electronically download full sets or purchase printed sets are automatically added to the list of plan holders. Obtaining Bidding Documents from any source not identified herein may result in failure to receive addenda, corrections, or other revisions that may be issued.

7. BID SECURITY

Bid security in the amount, form and subject to the conditions provided in the Instructions to Bidders must be submitted with each Bid.

8. WITHDRAWAL OF BIDS

Bids may not be withdrawn for a period of 120 days after the actual date of opening thereof. This time period may be extended by mutual agreement of the Owner and any Bidder or Bidders.

9. RIGHT TO REJECT BIDS

The Owner reserves the right to waive any irregularities and to reject any and all Bids.

10. PREBID CONFERENCE

A prebid conference will be held on May 25, 2023 at 10 a.m. local time at 310 Greenwood Street, Grand Ledge, Michigan 48837. Prospective Bidders are encouraged to attend and participate in the conference, but attendance is not mandatory.

11. ON-SITE LABOR

Owner financing agency requires that all on-site construction labor be paid prevailing wages.

END OF SECTION 00 11 13

SECTION 00 41 43 - BID - UNIT PRICE

Bid of _____ hereinafter called Bidder, organized and existing under the laws of or a resident of the State of _____, doing business as _____.*

*Insert as applicable: "a corporation", "a partnership" or "an individual".

To the City of Grand Ledge, hereinafter called Owner.

ARTICLE 1 – BID RECIPIENT

1.01 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2 – BIDDER'S ACKNOWLEDGEMENTS

2.01 Bidder accepts all of the terms and conditions of the Advertisement for Bids and Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for 120 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

ARTICLE 3 – BIDDER'S REPRESENTATIONS

3.01 In submitting this Bid, Bidder represents that:

A. Bidder has examined and carefully studied the Bidding Documents, other related data identified in the Bidding Documents, and the following Addenda, receipt of all which is hereby acknowledged:

Addendum Number	Addendum Date
_____	_____
_____	_____
_____	_____
_____	_____

B. Bidder has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

C. Bidder is familiar with and is satisfied as to Laws and Regulations that may affect cost, progress, and performance of the Work.

D. Bidder has carefully studied all:

(1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) that have been identified in the Supplementary Conditions as provided in paragraph 5.03 of the General Conditions, as containing reliable "technical data," and

(2) reports and drawings of Hazardous Environmental Conditions, if any, at the Site that have been identified in the Supplementary Conditions as provided in paragraph 5.06 of the General Conditions as containing reliable "technical data."

E. Bidder has considered the information known to Bidder; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on:

(1) the cost, progress, and performance of the Work;

(2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying the specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents; and

(3) Bidder's safety precautions and programs.

F. Based on the information and observations referred to in Paragraph 3.01.E above, Bidder does not consider that further examinations, investigations, explorations, tests, studies or data are necessary for the determination of this Bid for performance of the Work at the price(s) bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents.

G. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.

H. Bidder has given Engineer written notice of all conflicts, errors, ambiguities or discrepancies that Bidder has discovered in the Bidding Documents, and the written resolution thereof by Engineer is acceptable to Bidder.

I. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work for which this Bid is submitted.

ARTICLE 4 – BIDDER'S CERTIFICATION

4.01 Bidder certifies that:

A. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization or corporation;

B. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid;

C. Bidder has not solicited or induced any individual or entity to refrain from bidding; and

D. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 4.01.D:

(1) "corrupt practice" means the offering, giving, receiving, or soliciting of any thing of value likely to influence the action of a public official in the bidding process;

(2) "fraudulent practice" means an intentional misrepresentation of facts made

(a) to influence the bidding process to the detriment of Owner,

(b) to establish bid prices at artificial non-competitive levels, or

(c) to deprive Owner of the benefits of free and open competition;

(3) "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which to establish bid prices at artificial non-competitive levels; and

(4) "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

ARTICLE 5 – BASIS OF BID

5.01 Bidder will complete the Work in accordance with the Contract Documents for the following unit prices:

Unit Bid Price Schedule					
Item No.	Item Description	Unit	Total Estimated Quantity	Unit Price	Bid Price
1	Cash Allowances - Testing	Dollars	40,000	$1.00	$40,000
2	Mobilization (5% Maximum of Total Bid)	LS	1		
3	Maintaining Traffic	LS	1		
4	Preconstruction Video Documentation	LS	1		
5	Grading, Roadway	Sta	9		
6	Remove Concrete Curb and Gutter	LF	800		
7	Remove Concrete Sidewalk and Drive Approaches	SYD	375		
8	Remove Pavement, Full Depth	SYD	1850		
9	Remove Sewer Manhole, Valve Chamber or Catch Basin	EA	1		
10	Remove Tree, 6-inch to 18-inch Diameter	EA	2		
11	Clearing	LS	1		
12	Remove, Salvage and Reinstall Sign	EA	2		
13	Soil Erosion and Sedimentation Control	LS	1		
14	Aggregate Base, 8-inch	SYD	2050		
15	Curb and Gutter, Concrete	LF	800		
16	Driveway Approach, HMA	Ton	65		
17	Driveway Approach, Concrete, 6 inch	SFT	450		
18	Pavement, HMA 3C	Ton	320		
19	Pavement, HMA 4C	Ton	160		
20	Restoration, Lawn	SYD	8500		
21	Sidewalk Ramp, Concrete, ADA	SFT	120		
22	Sidewalk, Concrete, 4-inch	SFT	1575		
23	Sidewalk, Concrete, 6-inch	SFT	1350		
24	Subbase	CYD	700		
25	Tree, (Ulmus 'New Horizon'), 3-inch	EA	2		
26	Pavement Markings	LS	1		
27	Casting, Manhole, Adjust	EA	6		
28	Casting, Valve Box, Adjust	EA	2		
29	Valve and Box, Gate, 8-inch	EA	2		
30	Water Main Fitting, 8-inch, DI	EA	8		

Unit Prices have been computed in accordance with Paragraph 13.03 of the General Conditions.

Bidder acknowledges that estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all unit price Bid items will be based on actual quantities, determined as provided in the Contract Documents.

_____

Bidder (Firm or Corporation Name)

Unit Bid Price Schedule					
Item No.	Item Description	Unit	Total Estimated Quantity	Unit Price	Bid Price
31	Water Main Fitting, 8-inch, HDPE	EA	26		
32	Water Main Fitting HDPE to DI Transition	EA	2		
33	Water Main, 8-inch, DI CL 52	LF	60		
34	Water Main, 8-inch, HDPE, DIPS, DR 11, Open Cut	LF	2040		
35	Water Main, 8-inch, HDPE, DIPS, DR 11, HDD	LF	3520		
36	Combination Valve and Chamber	EA	3		
37	Catch Basin, 4-foot diameter	EA	1		
38	Storm Sewer, 12-inch, C-76, CL IV	LF	10		
39	Cash Allowance - Well 2 Electrical Improvements	Dollars	60,000	$1.00	$60,000
40	Settlement Monitoring	LS	1		
	TOTAL OF ALL BID PRICES				

Bid Alternate Items:

Unit Bid Price Schedule					
Item No.	Item Description	Unit	Total Estimated Quantity	Unit Price	Bid Price
Alt-1	Water Main, 8-inch, DI CL 52, HDD	LF	592		
Alt-2	Water Main, 8-inch, DI CL 52, NBR Gasket	LF	70		
Alt-3	Water Main Fitting, 8-inch, DI, NBR Gasket	EA	4		
Alt-4	Environmental Monitoring and PPE	LS	1		
Alt-5	Non-Hazardous Potentially Contaminated Soil Handling and Disposal	CYD	150		
Alt-6	Valve and Box, Gate, 12-inch	EA	2		
Alt-7	Water Main Fitting, 12-inch, DI	EA	8		
Alt-8	Water Main Fitting, 12-inch, HDPE	EA	26		
Alt-9	Water Main Fitting HDPE to DI Transition, 12-inch	EA	2		
Alt-10	Water Main, 12-inch, HDPE, DIPS, DR 11, Open Cut	LF	2040		
Alt-11	Water Main, 12-inch, HDPE, DIPS, DR 11, HDD	LF	3520		
Alt-12	Combination Valve and Chamber, 12-inch Pipe	EA	3		
Alt-13	Water Main, 12-inch, DI CL 52, HDD	LF	592		
Alt-14	Water Main, 12-inch, DI CL 52, NBR Gasket	LF	70		
Alt-15	Water Main Fitting, 12-inch, DI, NBR Gasket	EA	4		
	TOTAL OF ALL ALTERNATE BID PRICES				

Unit Prices have been computed in accordance with Paragraph 13.03 of the General Conditions.

Bidder acknowledges that estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all unit price Bid items will be based on actual quantities, determined as provided in the Contract Documents.

Bidder (Firm or Corporation Name)

ARTICLE 6 – TIME OF COMPLETION

6.01 Bidder agrees that the Work will be substantially complete no later than October 18, 2024 and completed and ready for final payment in accordance with paragraph 15.06 of the General Conditions on or before November 1, 2024

6.02 Bidder agrees that the Work will be substantially complete within 105 calendar days once work begins on site.

6.03 Bidder agrees that work will not take place during specified events as outlined in the Summary of Work.

6.04 Bidder accepts the provisions of the Agreement as to liquidated damages.

6.05 Bidder acknowledges that the Work will not begin until the Funding Agency contracting requirements have been met and a contract is executed. It is anticipated that this will occur on August 28, 2023, but subject to change as determined by the Funding Agency.

ARTICLE 7 – ATTACHMENTS TO THIS BID

7.01 The following documents are submitted with and made a condition of this Bid:

A. Required Bid security.

B. Evidence of authority to sign Bid, if Bid is submitted by a corporation, partnership or joint venture;

C. Certification Regarding Debarment, Suspension, and Other Responsibility Matters.

ARTICLE 8 – DEFINED TERMS

8.01 The terms used in this Bid with initial capital letters have the meanings indicated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

ARTICLE 9 – BID SUBMITTAL

9.01 This Bid is submitted by:

SUBMITTED on_____, 20___ BY: _____

Date* Name of Bidder*

_____ _____

Business Street Address* Signature

_____ _____

City, State, and Zip* Name and Title of Signatory*

_____

Telephone Number*

_____

Facsimile Number*

_____

E-mail Address*

*Typed or printed in ink.

END OF SECTION 00 41 43

SECTION 01 21 13 – CASH ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section provides for cash allowances which are included in the Contract Price.

B. Related Sections include Sections in Divisions 01 through 49, as identified below, provide additional information on what is covered by the respective allowances.

1.3 ALLOWANCES

A. Include in the Contract Price the following amounts:

1. The amount of $40,000 for payment of testing services by the independent testing laboratory as specified in Division 01 Section “Testing Services for Buried Utilities, Roadways, and Site Projects.”
2. The amount of ~~$100,000~~$60,000 for payment of Well 2 Electrical Improvements as specified in Division 26. The Owner will select the Electrical Contractor for this work item. The allowance is being utilized to allow flexibility and closer coordination of devices and implementation of the work. The intent is to utilize the same Electrical Contractor that will be working at the Iron Removal Plant (IRP) since this work potentially impacts operations at the IRP and within the Well 2 Wellhouse.

1.4 CASH ALLOWANCES

A. Costs Associated With Allowances:
1. All costs, associated with allowances, which are not specifically defined in the Schedule of Allowances, paragraph 1.3 of this Section shall be incidental to the major items of Work.
2. Associated costs not specifically defined in the Schedule of Allowances may include, but are not necessarily limited to:
   a. Unloading.
   b. Handling on the Site.
   c. Labor.
   d. Installation.
   e. Overhead.
   f. Profit.

1.5 ADJUSTMENT OF COSTS

A. Change Order: To adjust Contract Price if final cost is different from allowance.

B. Documentation:
1. Submit:
   a. Within 60 days after completion of the work under the allowance.
   b. Documentation of actual costs.
2. Failure to submit claims within the designated time will constitute a waiver of claims for additional costs.
3. At Contract closeout, reflect all approved changes in Contract amounts in the final statement of accounting.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION 01 21 13

SECTION 01 22 00 - UNIT PRICES - MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes descriptions of the method of measurement and the basis of payment for Unit Price Work under this Contract.

B. Basis of Contract Payments:
   1. Final Contract Price shall be determined by actual quantities installed at unit prices stated in Contractor's Bid.
   2. Engineer shall determine actual as-built quantities.
   3. All work identified on the Drawings, but not included as a Bid item shall be considered incidental to construction and not paid for directly, except Work that would be considered additional Work due to unforeseen conditions.
   4. Unit price payments for individual items shall include everything necessary for such item to function as intended in the system.
   5. Owner reserves the right to increase, decrease or eliminate any quantities for items listed in Contractor's Bid or which become a part of the Contract Documents.

C. Items included as incidental to Unit Prices for systems and appurtenances. Unless there is a specific pay item identified, the unit price payment shall include, but not be limited to:
   1. Clear, excavate, trench, bedding, trench backfill, compaction, disposal of items for clearing and unsuitable or excess excavated materials.
   2. Drainage of excavations including by-pass pumping of sewers if necessary**.**
   3. Temporary sheeting, bracing and shoring of excavations.
   4. Support, relocation, replacement, connection or reconnection of existing pipelines and utilities.
   5. Cleanup and surface restoration.
   6. Water service repair.
   7. Sewer lead repair.
   8. Bulk head of pipes to be abandoned.
   9. Removal of pipes, valves, structures and appurtenances located within the excavation limits of new utilities whether identified on the removal Drawing or not.
   10. Coordination of mail delivery and refuse removal with residents, post office, and refuse collectors.
   11. Dewatering for the installation of sanitary sewer, water main and storm sewer.
   12. Support of utility poles and existing underground utilities during excavation and installation of sanitary sewer, water main and storm sewer.
   13. Remove, salvage, and replace street signs.
   14. Remove and dispense of trees less than 6-inches in diameter.
   15. Protection of the work area including temporary fencing in park areas and other locations as necessary.

1.3 FISHBECK STANDARD PAY ITEMS - GENERAL REQUIREMENTS

A. Items for General Requirements include:

   1. Pay Item - Cash Allowance - Testing:
      a. Includes cash allowance for testing requirements in accordance with Division 01 Section "Testing Services for Buried Utilities, Roadways, and Site Projects."
      b. Unit of measure:
         1) Actual dollars paid to independent laboratory.
         2) General Contractor allowable mark-up is 10%.
         3) Documented by invoices.

2. Pay Item - Mobilization (5% Maximum of Total Bid):
   a. Includes:
      1) Preparatory work and expenses incurred prior to beginning work onsite.
      2) Transport materials, personnel, and equipment to the Site.
      3) Establish temporary onsite construction facilities.
      4) Provide insurance, bonds, and other costs associated with the project in general and not included in other pay items.
      5) All required submittals.
   b. Unit of Measure:
      1) Lump sum.
      2) 50% payment will be made after 5% of the original contract amount is earned.
      3) Final 50% payment will be made after 25% of the contract amount is earned.

3. Pay Item - Maintaining Traffic:
   a. Includes the following in accordance with Division 01 Sections "Summary of Work" and "Traffic Control:"
   b. Furnish, install, and maintain:
      1) Flag control.
      2) Detour signing.
      3) Work zone signing.
      4) Traffic control devices including barricades and barrels.
      5) Removal of conflicting pavement markings.
      6) Temporary pavement markings.
      7) Maintain access to residential driveways.
      8) Maintain access to commercial driveways.
      9) Temporary gravel as necessary to maintain driveway access.
   c. Unit of measure:
      1) Lump sum.
      2) 50% payment shall be made for installation of traffic control devices.
      3) 50% payment shall be made after removal of traffic control devices.

1.4 EXISTING CONDITIONS

A. Items for Existing Conditions include:

1. Pay Item - Preconstruction Video Documentation:
   a. Includes the following in accordance with Division 02 Section “Preconstruction Audio-Visual Documentation.”
      1) All DVD/Video CD disks.
      2) Reports.
   b. Measurement and Payment:
      1) Lump sum.
      2) Payment will be made after the Engineer has reviewed the audio-video documentation for completeness.

1.5 EARTHWORK

A. Items for Earthwork include:

1. Pay Item - Grading, Roadway:
   a. Includes the following in accordance with Division 31 Section "Grading:"
      1) Clear site and dispose of unsuitable materials within grading limits.
      2) Remove and stockpile topsoil.
      3) Cut, fill, shape, grade, compact, or otherwise prepare a finish subgrade.
      4) Proof roll subgrade to meet density requirements.
      5) Shape, grade, and compact onsite subbase material.
      6) Protect, salvage, or replace private irrigation systems in the project limits.
   b. Unit of Measure:
      1) Station.
      2) Measured along centerline of roadway only where roadway reconstruction work is occurring.

3) Is not paid where Horizontal Directional Drilling is occurring or in areas where only driveways or lawn restoration is occurring. .

2. Pay Item - Remove Concrete Curb and Gutter:
   a. Includes the following in accordance with Division 31 Sections "Grading" and "Excavation and Fill for Utilities."
      1) Sawcut, remove, and dispose of existing concrete curbs, integral curb and gutter, and gutter pans.
   b. Unit of Measure: Foot.

3. Pay Item - Remove Concrete Sidewalk and Drive Approaches:
   a. Includes the following in accordance with Division 31 Sections "Grading" and "Excavation and Fill for Utilities."
      1) Sawcut, remove, and dispose of existing concrete walks and drive approaches and remove base materials to obtain proposed grade.
   b. Unit of Measure: Square yard.

4. Pay Item - Remove Pavement, Full Depth:
   a. Includes the following in accordance with Division 31 Sections "Grading" and "Excavation and Fill for Utilities:"
      1) Sawcut, remove (full depth) and dispose of existing bituminous, concrete, and composite pavement materials.
   b. Unit of Measure: Square yard.

5. Pay Item - Remove Sewer Manhole, Valve Chamber or Catch Basin:
   a. Includes the following in accordance with Division 31 Section "Excavation and Fill for Utilities:"
      1) Excavate, remove and dispose of existing concrete or brick storm or sanitary sewer manholes or catch basins not within the excavation limits of new construction.
      2) Backfill and compaction.
   b. Unit of measure: Each.

6. Pay Item - Remove Tree _ to __-inch Diameter:
   a. Includes the following in accordance with Division 31 Section "Grading:"
      1) Remove trees, including stumps and roots, to 2 feet below finished grade, dispose of stumps and roots.
      2) Dispose of all tree material not specifically retained by property owner.
   b. The size of trees shall be determined by the average diameter of the tree trunk, measured to the nearest full inch, at a point 4-1/2 feet above the base of the tree from the ground line. Trees having major limbs lower than 4-1/2 feet from the ground shall be measured at the smallest diameter below such limbs.
   c. Does not include the removal of trees in designated clearing areas.
   d. Unit of Measure:
      1) Several trees originating from the same ground level trunk shall be measured separately.
      2) Each.

7. Pay Item – Clearing:
   a. Includes the following in accordance with Division 31 Section “Grading”
      1) Remove all plants, including shrubs, brush, trees and stumps in clearing area.
      2) Protect all vegetation not designated for removal adjacent to clearing area.
      3) Dispose of removed materials.
   b. Unit of Measure: Lump Sum

8. Pay Item - Remove, Salvage and Reinstall Sign:
   a. Includes the following in accordance with Division 31 Section “Grading”
      1) Remove and salvage signs and posts.
      2) Store and protect salvaged sign and sign posts.
      3) Furnish and maintain temporary regulatory signs.
      4) Reinstall salvaged sign and sign posts in accordance with the MUTCD
      5) Furnish and install new sign and sign posts to replace those damaged by construction or stolen.
   b. Unit of Measure: Each.

9. Pay Item - Soil Erosion and Sedimentation Control:
   a. Includes the following in accordance with Division 31 Sections "Erosion and Sedimentation Controls:"
      1) Review the soil erosion control plan and Soil Erosion Control Permit.
      2) Install and maintain the required soil erosion and sedimentation control measures as indicated on the Drawings and any other measure as necessary to adequately control soil erosion and sedimentation on the project.
      3) Submit copies of product information for all SESC BMP's.
      4) Submit Certificate of Certified Storm Water Operator.
      5) Organize and proceed over SESC Preconstruction Meeting. Provide inspections by a certified Storm Water Operator and submit reports until Notice of Termination is Issued.
      6) Maintain Storm Water Operators Log during construction and provide to Engineer at completion of project.
      7) Sweep and clean roadways and sidewalks as required.
      8) Maintain dust control.
      9) Maintain silt fence, catch basin inlet filters and all other BMP's as required.
      10) Clean new catch basins and storm sewers at the completion of construction if needed.
      11) Clean exiting catch basins and storm sewers near construction project if impacted by construction.
      12) Remove temporary soil erosion and sedimentation control measures after site is stabilized.
      ~~12)~~13) Complete SESC permit and pay all Permit fees to the local Enforcing Agent.
   b. Unit of Measure:
      1) Lump sum.
      2) 50% payment shall be made for installation of soil erosion and sedimentation control measures.
      3) 50% payment shall be made upon project completion after removal of soil erosion and sedimentation control measures.
      4) Payment for SESC measures beyond those identified on the Drawings required by Contractors operations will not be considered for additional payment.
      5) Payment for additional SESC measures required by Engineer will be administered through the Change Order process.

1.6 EXTERIOR IMPROVEMENTS

A. Items for Exterior Improvement Include:

1. Pay Item - Aggregate Base, __ inch:
   a. Includes the following in accordance with Division 32 Section "Aggregate Base Courses:"
      1) Furnish, place, and compact base material.
      2) Prepare subgrade.
      3) Proof roll subgrade.
      4) Furnish, place, and compact aggregate for bituminous or concrete pavement.
   b. Unit of measure: Square yard, compacted in place.

2. Pay Item - Curb and Gutter, Concrete:
   a. Includes the following in accordance with Division 32 Section "Concrete Curbs and Gutters:"
      1) Furnish and place concrete curb and gutter, gutter pans, curb radii.
      2) Provide longitudinal reinforcement.
      3) Provide lane ties where curb is adjacent to concrete paving.
   b. Unit of measure: Foot measured along the face of the curb, radii and gutter pans.

3. Pay Item - Driveway Approach, HMA:
   a. Includes the following in accordance with Division 32 Section “Asphalt Paving.”
      1) Prepare subgrade.
      2) Furnish, place, and compact base material to a minimum depth of 6 inches.
      3) Furnish and place HMA paving.
   b. Unit of measure: Ton.

4. Pay Item - Driveway Approach, Concrete, __-inch:
   a. Includes the following in accordance with Division 32 Section "Concrete Walks:"
      1) Prepare subgrade.

2) Furnish, place, and compact base material to a minimum depth of 6 inches.
3) Furnish and place concrete paving.
4) Provide additional cement in mix for High Early concrete.

b. Unit of measure: Square foot.

5. Pay Item - Pavement, HMA 3C & 4C:
   a. Includes the following in accordance with Division 32 Section "Asphalt Paving:"
      1) Prepare aggregate base.
      2) Furnish, place, and compact bituminous leveling and top course mixture.
   b. Unit of measure: Ton.

6. Pay Item - Restoration, Lawn:
   a. Includes the following in accordance with Division 31 Sections "Grading" and Division 32 Section "Turf and Grasses:"
      1) Furnish, place, and grade topsoil.
      2) Place hydroseed.
      3) Place mulch and mulch anchoring.
      4) Maintain until final completion.
   b. Does not include restoration of any areas disturbed due to Contractor's operation that are outside the limits of normal construction.
   c. Unit of measure: Square yard

7. Pay Item - Sidewalk Ramp, Concrete, ADA:
   a. Includes the following in accordance with Division 32 Section "Concrete Walks:"
      1) Furnish and place EJIW Cast Iron Detectable Warning Strips (24-inch by 60-inch per ramp).
   b. Does not include concrete walk surrounding tactile warning plate. Surrounding concrete to be paid concrete sidewalk.
   c. Unit of measure: Square feet of tactile warning plate placed.

8. Pay Item - Sidewalk, Concrete __-inch:
   a. Includes the following in accordance with Division 32 Section "Concrete Walks:"
      1) Prepare subgrade.
      2) Furnish, place, and compact base material.
      3) Furnish and place concrete sidewalks.
      4) Provide additional cement for High Early strength concrete in concrete pours where drives must be open to traffic within 24 hours.
   b. Unit of measure: Square feet.

9. Pay Item - Subbase:
   a. Includes the following in accordance with Division 32 Section "Aggregate Base Courses:"
      1) Furnish, place, and compact subbase material.
      2) Prepare subgrade.
      3) Proof roll subgrade.
   b. Unit of measure: Cubic yard, compacted in place.

10. Pay Item - Tree, (Species), __-inch:
    a. Includes the following in accordance Division 32 Section "Planting."
       1) Furnish and install trees.
       2) Water and maintain trees until final completion.
    b. Unit of measure: Each.

11. Pay Item – Pavement Markings
    a. Includes the following in accordance with Division 32 Section “Pavement Markings”
       1) Furnish and place white or yellow pavement marking paint.
       2) Furnish and place cold plastic pavement markings.
    b. Unit of Measure: Lump Sum

1.7 UTILITIES - MISCELLANEOUS

A. Items for Miscellaneous Utilities include:

1. Pay Item - Casting, Manhole, Adjust:
   a. Includes the following in accordance with Division 33 Section "Storm Drainage Utilities:"
      1) Sawcut existing pavement, curb, and curb and gutter where required.
      2) Adjust the existing casting up or down to the finish grade.
      3) Remove and replace the pavement adjacent to the adjusted cover.
   b. Unit of Measure: Each.

2. Pay Item - Casting, Valve Box, Adjust:
   a. Includes the following in accordance with Division 33 Sections "Water Utilities":
      1) Sawcut existing pavement, curb, and curb and gutter where required.
      2) Adjust the existing casting up or down to the finish grade.
      3) Remove and replace the pavement adjacent to the adjusted cover.
   b. Unit of Measure: Each.

1.8 UTILITIES - WATER UTILITIES

A. Items for Water Utilities include:

1. Pay Item - Valve and Box, Gate, __-inch:
   a. Includes the following in accordance with Division 33 Section "Water Utilities:"
      1) Furnish and install valve and valve box adjusted to finished grade.
   b. Unit of Measure: Each.

2. Pay Item - Water Main Fitting, __-inch, DI:
   a. Includes the following in accordance with Division 33 Section "Water Utilities:"
      1) Furnish and install fitting and joint restraint.
   b. Unit of Measure:
      1) Each.
      2) Fitting size is determined by the largest diameter connection.
   c. Unit of Measure: Each.

3. Pay Item - Water Main Fitting, __-inch, HDPE:
   a. Includes the following in accordance with Division 33 Section "Water Utilities:"
      1) Furnish and install fitting.
   b. Unit of Measure:
      1) Each.
      2) Fitting size is determined by the largest diameter connection.

4. Pay Item – Water Main Fitting, HDPE to DI Transition:
   a. Includes the following in accordance with Division 33 Section “Water Utilities:”
      1) Furnish and install fittings to complete the transition.
      2) Heat fused HDPE transition.
      3) Stiffener spool on the inside of the HDPE.
      4) Mechanical joint connection to DI pipe or fitting
      5) Furnish and install concrete anchor.
   b. Unit of Measure:
      1) Each.
      2) Fitting size is determined by the largest diameter connection.

5. Pay Item - Water Main, __-inch, DI CL__:
   a. Includes the following in accordance with Division 31 Sections "Excavation and Fill for Utilities" and Division 33 Section "Water Utilities:"
      1) Furnish, install, and test water main.
      2) Excavate, backfill, and compact trench.
      3) Provide pipe bedding and trench backfill material.

b. Unit of Measure:
   1) Foot.
   2) Measure from center of fitting to center of fitting along centerline of pipe.

6. Pay Item - Water Main, __-inch, HDPE ____, Open-Cut:
   a. Includes the following in accordance with Division 31 Sections "Excavation and Fill for Utilities" and Division 33 Section "Water Utilities:"
      1) Furnish, install, and test water main.
      2) Excavate, backfill, and compact trench.
      3) Tracer wire.
      4) Provide pipe bedding and trench backfill material.
   b. Unit of Measure:
      1) Foot.
      2) Measure from center of fitting to center of fitting along centerline of pipe.

7. Pay Item – Water Main, __-inch, HDPE ____, HDD:
   a. Includes the following in accordance with Division 31 Sections “Excavation and Fill for Utilities” and Division 33 Sections "Utility Horizontal Directional Drilling” and “Water Utilities:”
      1) Excavation and backfill of boring and receiving pits.
      2) Water Main: Furnished and installed: High Density Polyethylene.
      3) Fusing and assembly and staging of pipe
      4) Barricading and protection of uninstalled pipe.
      5) Installation by horizontal directional drill methods.
      6) Determination of means and methods for completing the HDD installation including but not necessarily limited to, maintaining hole stability and pulling new pipe back through the hole while protecting all existing structures, pavement, and utilities.
      7) Locating potential utility crossing elevations of the HDD path and determining route to avoid damage to existing crossings.
      8) Tracer Wire
      9) Provide pipe bedding and trench backfill material.
      10) Testing
   b. Unit of Measure: Foot.
   c. Measure from center of fitting to center of fitting along centerline of pipe of installed and connected. Additional length of pipe for entrance and exit of bore is incidental and shall be included in the per foot cost.

8. Pay Item – Combination Valve and Chamber:
   a. Includes the following in accordance with Division 31 Sections “Excavation and Fill for Utilities” and Division 33 Sections and Division 40 “Combination Air Valves:”
      1) Furnish and install precast concrete structure, including steps, flow channel and pipe connections.
      2) Furnish and install casting, adjusted to finish grade.
      3) Furnish and install all water main fittings and mechanical joint restraints from HDPE Transition to HDPE Transition.
      4) Furnish, install and test combination valve.
      5) Furnish and install vent piping as identified on detail.
      6) Provide stone and geotextile fabric.
      7) Excavate, install foundation material, and backfill around catch basin.
      8) Provide resilient connector between pipe and manhole
      9) Provide pipe bedding and trench backfill material.
   b. Unit of Measure: Each.

1.9 UTILITIES - STORM DRAINAGE UTILITIES

A. Items for Storm Drainage Utilities include:

1. Pay Item - Catch Basin, __-foot diameter:
   a. Includes the following in accordance with Division 31 Section "Excavation and Fill for Utilities" and Division 33 Section "Storm Drainage Utilities:"
      1) Furnish and install precast concrete drainage structure, including steps, flow channel and pipe connections and sump.
      2) Furnish and install casting, adjusted to finish grade.
      3) Provide stone and geotextile fabric.
      4) Excavate, install foundation material, and backfill around catch basin.
      5) Provide resilient connector between pipe and manhole for all pipe diameters less than or equal to 24 inch.
   b. Unit of Measure: Each.

2. Pay Item - Storm Sewer, __-inch, C-76, CL__:
   a. Includes the following in accordance with Division 31 Section "Excavation and Fill for Utilities" and Division 33 Section "Storm Drainage Utilities:"
      1) Furnish and install and storm sewer.
      2) Excavate, backfill and compact trench.
      3) Provide pipe bedding and trench backfill material.
      4) Connect to existing storm sewer, including geotextile fabric wrap.
      5) Connect to existing storm structure.
   b. Unit of Measure:
      1) Linear foot.
      2) Measure from centerline of drainage structure to centerline of drainage structure or end of pipe along the centerline.

1.10 PROJECT SPECIFIC PAY ITEMS

A. Project Specific Items include:

1. Pay Item – Cash Allowance - Well 2 Electrical Improvements:
   a. Includes Cash Allowance for the following in accordance with Division 26 Specifications.
      1) Furnish, install and test all electrical items associated with Well 2 electrical improvements as identified in the drawings and details.
   b. Unit of Measure:
      1) Actual dollars paid to Electrical Integrator as selected by the Owner
      2) General Contractor allowable mark-up is 10%
      3) Documented by invoices

2. Pay Item - Settlement Monitoring:
   a. Includes the following in accordance with Division 01 Section “Monitoring of Existing Conditions”
      1) Preconstruction Survey.
      2) Installation of monitor points.
      3) Monitoring of settlement markers.
      4) Reporting.
      5) Removal of monitor points.
   b. Unit of Measure: Lump Sum.

1.11 BID ALTERNATE PAY ITEMS

A. Items for Bid Alternate include:

1. Pay Item – Water Main, -inch, DI CL 52, HDD:
   a. Includes the following in accordance with Division 31 Section “Excavation and Fill for Utilities” and Division 33 Sections "Utility Horizontal Directional Drilling” and “Water Utilities:”
      1) Excavation and backfill of boring and receiving pits.
      2) Water Main: Furnished and installed: Ductile Iron Class 52.
      3) Nitrile (NBR) Gaskets at all joints.
      4) Polyethylene encasement.
      5) Fusing and assembly and staging of pipe.
      6) Barricading and protection of uninstalled pipe.
      7) Installation by horizontal directional drill methods.
      8) Determination of means and methods for completing the HDD installation including but not necessarily limited to, maintaining hole stability and pulling new pipe back through the hole while protecting all existing structures, pavement, and utilities.
      9) Locating potential utility crossing elevations of the HDD path and determining route to avoid damage to existing crossings.
      10) Tracer Wire.
      11) Provide pipe bedding and trench backfill material.
      12) Testing.
   b. Unit of Measure: Foot.
      1) Measure from center of fitting to center of fitting along centerline of pipe of installed and connected. Additional length of pipe for entrance and exit of bore is incidental and shall be included in the per foot cost.

2. Pay Item - Water Main, -inch, DI CL 52, NBR Gasket:
   a. Includes the following in accordance with Division 31 Section "Excavation and Fill for Utilities" and Division 33 Section "Water Utilities:"
      1) Furnish, install, and test water main.
      2) Excavate, backfill, and compact trench.
      3) Provide pipe bedding and trench backfill material.
      4) Nitrile (NBR) Gaskets.
      5) Polyethylene Encasement.
   b. Unit of Measure:
      1) Foot.
      2) Measure from center of fitting to center of fitting along centerline of pipe.

3. Pay Item - Water Main Fitting, __-inch, DI, NBR Gasket:
   a. Includes the following in accordance with Division 33 Section "Water Utilities:"
      1) Furnish and install fitting and joint restraint.
      2) Nitrile (NBR) Gasket.
   b. Unit of Measure:
      1) Each.
      2) Fitting size is determined by the largest diameter connection.

4. Pay Item – Environmental Monitoring and PPE:
   a. Includes the following in accordance with Division 01 Section “Contaminated Soil and Groundwater Procedures:”
      1) Review and understand included Environmental Management Plan (EMP).
      2) Comply and follow Breathing Zone monitoring procedures and requirements.
      3) Personal Protective Equipment (PPE).
   b. Unit of Measure: Lump Sum.

5. Pay Item – Non-Hazardous Potentially Contaminated Soil Handling and Disposal:
    a. Included the following in accordance with Division 01 Section "Contaminated Soil and Groundwater Procedures" and Division 31 Section "Excavation and Fill for Utilities:"
        1) Stockpile potentially contaminated soils for testing purposes.
        2) Loading and transport of soils to designated disposal facility after testing has been completed. (For purposes of the Bid, assume the disposal facility is within 30 miles of the Site.)
    b. Does not Include the following:
        1) Sampling and testing of soil which will be completed and paid for by the Owner.
        2) Tip fees at the landfill which will be paid for by the Owner.
    c. Unit of Measure:
        1) Cubic yard as determined by landfill weigh ticket.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION 01 22 00

SECTION 01 35 46 – CONTAMINATED SOIL AND GROUNDWATER PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the procedures for handling contaminated or potentially contaminated soil and groundwater.

1.3 REFERENCES

A. Except as herein specified or as indicated on the Drawings, the work of this Section shall comply with the following:
   1. MDOT:
      a. 2003 Standard Specifications for Construction.
      b. Standard Plans.
   2. Federal Regulation 29 CFR Part 1910.120.

1.4 DEFINITIONS

A. Abbreviations:
   1. VOC: Volatile Organic Chemicals.
   2. HAA: Health Advisory Area.
   3. OSHA: United States Occupational Safety and Health Administration.
   4. MDPH: Michigan Department of Public Health.
   5. MIOSHA: Michigan Occupational Safety and Health Administration.
   6. NPDES: National Pollution Discharge Elimination System.

B. Terms:
   1. Temporary Exclusion Zone:
      a. A designated area where the possibility of contact with hazardous materials exists.
      b. Personnel working in area must meet health and safety training requirements in accordance with Federal Regulation 29 CFR Part 1910.120 until the area has been determined to be clean.
   2. Exclusion Zone:
      a. A designated area where contact with hazardous materials is expected.
      b. Personnel working in area must meet health and safety training requirements in accordance with Federal Regulation 29 CFR Part 1910.120.
   3. Clean Area:
      a. A designated area where the possibility of contact with hazardous materials has been removed.
      b. Personnel working in this area are not required to meet health and safety training requirements in accordance with Federal Regulation 29 CFR Part 1910.120.
   4. Health Advisory Area:
      a. A portion of the Site, as indicated on the Drawings, which has been designated by the MDPH.
      b. Water from private water supply wells in the HAA has been found to contain VOCs.

1.5 PERFORMANCE REQUIREMENTS

A. Be Responsible For:
   1. Complying with requirements of Federal Regulation 29 CFR Part 1910.120.
   2. Health and safety training for Contractor's employees.
   3. Providing employees with adequate protective equipment.

B. Temporary Exclusion Zone:
   1. Initially: An area surrounding excavation work within the HAA.
   2. After initial testing and monitoring: Owner will designate the area as either a Clean Area or an Exclusion Zone.

C. Clean Area: Monitor to ensure that the area remains free from exposure to hazardous materials.

D. Exclusion Zone: Monitor to ensure proper compliance with Federal Regulations.

1.6 SUBMITTALS

A. Certificates of Health and Safety Training:
   1. Prior to the start of excavation in the HAA.
   2. For employees who may work in a Temporary Exclusion Zone and an Exclusion Zone.

1.7 PROJECT CONDITIONS

A. Engineer's Health and Safety Plan:
   1. For Engineer's use only.
   2. Available as information for Contractor.
   3. Engineer may monitor for contaminants:
      a. In compliance with Engineer's Health and Safety Plan.
      b. Results will be made available for Contractor's information.

B. Environmental Management Plan (EMP):
   1. EMP has been prepared for work in the area as described in the EMP.
   2. EMP is included as an attachment to this specification section.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION 01 35 46

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Environmental Management Plan

SUBJECT: Installation of 8-inch Raw Water Line form Well 2 to Grand Ledge Iron Removal Plant
Grand Ledge, Michigan

DATE: May 23, 2023 **PROJECT NO.:** 221916

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Abbreviations/Acronyms

bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylene
BZ	breathing zone
City	City of Grand Ledge
EGLE	Michigan Department of Environment, Great Lakes, and Energy
EMP	Environmental Management Plan
FAR	Final Assessment Report
ft	foot/feet
ft/ft	feet per foot
HDPE	high-density polyethylene
IDLH	Immediately Dangerous to Life or Health
LEL	lower explosive limit
MTBE	methyl-tert butyl ether
NREPA	Natural Resources and Environmental Protection Act
OSHA	Occupational Safety and Health Administration
PEL	permissible exposure limit
PID	photoionization detector
PPE	personal protective equipment
ppm	parts per million
ROW	right-of-way
TMB	trimethylbenzene
TWA	time-weighted average
UST	underground storage tank
VOC	volatile organic compound

Introduction

An Environmental Management Plan (EMP) has been developed for the installation of the 8-inch raw water line in Grand Ledge, Michigan. In accordance with Michigan's Part 201 of the Natural Resources and Environmental Protection Act (NREPA) also known as the *Michigan Environmental Remediation Act*, Part 213 of the NREPA, and the Occupational Safety and Health Administration (OSHA) regulations: 29 CFR 1910, Occupational Safety and Health Standards, Section Subpart Z – *Toxic and Hazardous Substance*. An EMP outlines the strategies, actions, and procedures to be implemented to effectively manage and mitigate environmental impacts associated with a project, operation, or organization. It provides a framework for identifying, assessing, and managing potential environmental risks, as well as ensuring compliance with environmental regulations and standards. The primary goal of the EMP is to promote sustainable practices, minimize adverse environmental effects, and enhance environmental performance.

Background

Based on information obtained from the Michigan Department of Environment, Great Lakes, and Energy (EGLE), one property along the proposed installation route – 505 West Saginaw Highway, Grand Ledge, Michigan (subject property) – required additional historical environmental file review due to multiple underground storage tank (UST) releases near the proposed path of the raw water line installation. While it is unlikely that impacted soil or groundwater will be encountered during installation of the water line, out of an abundance of caution, Fishbeck has prepared this EMP in the event that petroleum constituents of concern are encountered during the installation. The action items detailed in this EMP were developed to mitigate potential environmental and worker safety concerns.

Scope of Work

Fishbeck has prepared contract documents to solicit bids to install an 8-inch-diameter high-density polyethylene (HPDE) raw water line extending from Well 2 to the City of Grand Ledge (City) Iron Removal Plant; the water line is proposed to be installed at a depth of 13 to 15 feet below ground surface (ft bgs) in the area of concern.

This EMP applies to the installation of approximately 145 ft of the north/south section of the raw water line located 75 ft north of Saginaw Highway on De Groff Street in the western right of way (ROW); it bisects Saginaw Highway to the south and travels west along the southern ROW of Saginaw Highway for 100 ft west of Chester Street (see Figure 1).

Subject Property File Review

Fishbeck reviewed the April 24, 2003, *Final Assessment Repor*t (FAR) prepared by Superior Environmental Corporation (Superior). The FAR identified multiple UST releases related to the subject property which were reported to EGLE. Releases of gasoline occurred April 7, 1989 (release ID No. C-0110-89) and October 9, 1989 (release ID No. C-0656-89). Five USTs were removed in 1989 and replaced with three new USTs. During removal of the USTs, additional excavation of impacted soil was conducted in the south and west ROWs of Saginaw Highway and DeGroff Street. A total of 3,619 cubic yards of impacted soil were excavated and disposed at a certified landfill.

Soil Conditions and Characteristics

Based on the FAR, soil conditions and characteristics identified through investigative efforts are as follows:

- 0-25 ft bgs – brown to gray, soft, moist clay containing thin sand seams

- 25-45 ft bgs – fine- to medium-grained sand, well sorted
- 45-48 ft bgs – friable sandstone was encountered

Conclusions by Superior indicate that the majority of impacts were found in the discontinuous thin sand seams in the 0 to 25 ft bgs lithology at the site. Soil impacts identified during the Phase II Environmental Site Assessment investigation and UST removal are summarized in Table 1.

Table 1 – Maximum Soil Analytical Results

Contaminant Compound	CAS Number	Max. Detected Contaminant Concentration	Soil Boring with Max. Conc.	Tier I DW/VIA Criteria (ug/kg)	No. Samples Exceeding Criteria
Benzene	71-43-2	1,500 µg/kg	SB-8 (6-8')	100/5600	8/0
Toluene	108-88-3	11,000 µg/kg	SB-10 (4-6')	16,000/5.3E+5	0/0
Ethylbenzene	100-41-4	6,400 µg/kg	SB-10 (4-6')	1,500/1.1E+5	5/0
Xylenes	1330-20-7	27,000 µg/kg	SB-24 (4-6')	5,600/1.9E+5	4/0
MTBE	1634-04-4	ND µg/kg	ALL	800/4.7E+7	0/0
Naphthalene	91-20-3	1,930 µg/kg	DW-1 (7')	5,500/31,000	0/0
2-Methynaphthalene	91-57-6	3,120 µg/kg	DW-1 (7')	57,000/ID	0/0
1,2,4-TMB	95-63-6	11,600 µg/kg	DW-1 (7')	2,100/56,000	1/0
1,3,5-TMB	108-67-8	2,800 µg/kg	DW-1 (7')	1,800/61,000	1/0
DW = DRINKING WATER VIA = VOLATILIZATION TO INDOOR AIR ID = INSUFFICIENT DATA					

Soil impacts identified in historical Phase II site investigations are not expected to be encountered in the western ROW of DeGroff Street – the proposed location of the 8-inch raw water. Petroleum impacts in soil were observed in the southern ROW of Saginaw Highway at a depth of 5 to 7 ft bgs.

Based on the clay lithology and proposed installation depth (13 to 15 ft bgs) of the water supply line, it is not anticipated that constituents of concern will be encountered.

Groundwater Conditions and Characteristics

The FAR described historical groundwater conditions and characteristics. Historic groundwater was found at a depth of 2 to 9 ft bgs in a shallow perched zone. Prior to 1993, a deeper aquifer was reported at 26 to 28 ft bgs. After a municipal well was put into service in 1993, static water levels in the deeper aquifer were gauged (in 2002 and 2003) at 40 to 46 ft bgs. Historical investigations have determined that impacted groundwater has only been observed in the shallow perched water zone. In 1993,groundwater flow direction was reported to be toward the southwest with a hydraulic gradient of 0.036 feet per foot (ft/ft).

Groundwater impacts identified in the FAR are presented in Table 2.

Table 2 – Maximum Groundwater Analytical Results

Contaminant Compound	CAS Number	Max. Detected Contaminant Concentration	Monitor Well with Max. Conc.	Tier 1 RBSL	Samples Exceeding Criteria
Benzene	71-43-2	464 µg/L	SA-2	5 µg/L (DW)	2
Toluene	108-88-3	322 µg/L	SA-2	790 µg/L(DW)	1
Ethyl-benzene	100-41-4	710 µg/L	SA-2	74 µg/L(DW)	3
Xylenes	1330-20-7	2,550 µg/L	SA-2	280 µg/L(DW)	1
MTBE	1634-04-4	ND	-	40 µg/L(DW)	0
Naphthalene	91-20-3	209 µg/L	SA-2	520 µg/L(DW)	0
2-Methylnaphthalene	91-57-6	90 µg/L	SA-2	260 µg/L(DW)	0
1,2,4-TMB	95-63-6	680 µg/L	SA-2	63 µg/L(DW)	2
1,3,5-TMB	108-67-8	303 µg/L	SA-2	72 µg/L(DW)	2

Groundwater impacts identified in historical Phase II ESA investigations have not been encountered in the western ROW of DeGroff Street or the southern ROW of Saginaw Highway –the proposed location of the raw water line. In February and early March of 2023, Materials Testing Consultants, Inc. conducted soil exploration in the area to a depth of 25 ft; groundwater was not encountered. Absence of groundwater in the shallow, perched aquifer could be attributed to the municipal well which was put into service in 1993.

Soil Cutting/Drilling Mud Collection, Containerizing and Analysis

Soil cuttings/drilling mud will require collection and containerization during horizontal drilling operations in areas that may be impacted with hazardous constituents of concern. These soil cuttings/drilling mud will require careful handling, containerization, and analysis to ensure accurate assessment of contamination levels.

Preparation Considerations

Staffing: Staff selected to conduct the soil cutting/drilling mud sampling require Hazardous Waste Operations and Emergency Response (HAZWOPER) training in accordance with OSHA 29 CFR 1910.120.

Identify EMP Location: Mark out the specific areas along the horizontal drilling path where potential gasoline impacts may occur in soil cuttings/drilling mud. These locations have been identified on Figure 1 based on the historical soil and groundwater assessment activities reported in the FAR and summarized herein.

Obtain Sampling Equipment: Gather the necessary equipment, including clean sampling tools (e.g., shovels), sample containers (preferably pre-cleaned and pre-labeled), personal protective equipment (PPE), and any additional supplies required for proper sample collection.

PPE Requirements: Ensure that personnel involved in sample collection wear appropriate PPE, such as gloves, safety glasses, and dust masks, to minimize exposure to contaminants.

Breathing Zone Monitoring: Arrange for an individual to conduct dedicated breathing zone monitoring. See Section: *Breathing Zone Monitoring Plan for Worker Safety during Horizontal Drilling*.

Soil Cutting/Drilling Mud Collection

Soils extracted from the EMP location will be placed into lined containers (roll-off dumpsters) to avoid contact with the environment. If soils cannot be placed directly into an appropriately lined container and is required to be staged on the ground, the ground surface must be covered with 6-millimeter visqueen prior to staging soils.

Staged soil will be placed in the appropriately lined container(s) within the same work shift in which it was created.

Soil Cutting/Drilling Mud Containerization

Soil Volume Calculations: Determine the volume of soil anticipated to be removed during the horizontal drilling activities in the EMP location.

Soil Cutting Containerization: Based on the calculation of the estimated soil volume, procure an appropriate number of roll-off dumpsters. Dumpsters will require to be lined and must have the ability to be covered in the event of multi-day events and to minimize employee exposure to potentially impacted soils.

Container Staging: Lined dumpsters will require a staging area. The contractor is responsible for arranging a staging area that meets local and state laws and regulations.

Soil/Drilling Mud Sampling

All soil cuttings/drilling mud from locations identified in this EMP will require laboratory analysis prior to landfill disposal. A certified landfill will provide a list of testing required prior to disposal. Sample collection steps include the following:

Soil Cuttings Collection: As soil cuttings/drilling mud are generated during the horizontal drilling process, collect two random grab samples using clean tools.

Drilling Mud Collection: If drilling mud is created during the horizontal drilling, process water will need to be sampled and analyzed separately. It must be decanted from the lined roll off and disposed in accordance with all federal, state, and local laws and ordinances.

Sample Packaging: Place the collected soil cuttings in pre-labeled, airtight sample containers. Each container should be properly sealed to prevent cross-contamination and maintain sample integrity.

Chain of Custody: Document the chain of custody information, including the date, time, location, and individuals involved in the sample collection process. This ensures traceability and accountability throughout the handling and analysis phases.

Sample Handling and Storage

Transportation: Transport the sample containers to a designated laboratory or analysis facility using appropriate measures to prevent spills, leaks, or other incidents during transit.

Storage: If immediate analysis is not possible, store the sample containers in a cool, dry place away from direct sunlight, extreme temperatures, and potential sources of contamination. Follow any specific storage requirements provided by the laboratory or regulatory guidelines.

Laboratory Analysis

Select Accredited Laboratory: Choose a laboratory with accreditation for analyzing soil samples, specifically for gasoline constituents of concern. Ensure the laboratory follows appropriate methods and quality assurance/ quality control protocols.

Sample Submission: Complete the necessary paperwork required by the laboratory, including sample submittal forms, chain of custody documentation, and any specific instructions for analysis. Provide accurate and detailed information about the project, sampling locations, and any specific requirements for the analysis.

Analysis Parameters: Clearly communicate the specific gasoline constituents of concern to be analyzed in the soil cutting samples. This may include hydrocarbon compounds typically found in gasoline, such as benzene, toluene, ethylbenzene, and xylene (BTEX).

Data Interpretation and Reporting

Receive Analytical Results: Upon completion of the analysis, obtain the analytical results from the laboratory. Review the data carefully, ensuring it meets the required detection limits and any regulatory standards or guidelines.

Data Interpretation: Interpret the analytical results in the context of the project's objectives, regulatory requirements, and potential risk assessment. Assess the soil contamination levels based on the gasoline constituents of concern.

Reporting: Prepare a report documenting the sample collection process and laboratory analysis results. Include the laboratory's analytical certificate, chain of custody documentation, and associated data interpretations. Provide the results to the certified landfill to ensure soil cuttings/drilling mud meets the disposal criteria.

Breathing Zone Monitoring Plan for Worker Safety During Horizontal Drilling

The purpose of this EMP is to establish a systematic approach for conducting breathing zone (BZ) monitoring using a photoionization detector (PID) to ensure worker safety during horizontal drilling operations where there is potential exposure to BTEX, methyl-tert butyl ether (MTBE), naphthalene, 2-methylnaphthalene, 1,2,4-trimethylbenzene (TMB), and 1,3,5-TMB. This plan outlines action items to be taken when the permissible exposure limit/c (PEL/TWA), Immediately Dangerous to Life or Health (IDLH), or lower explosive limit (LEL) is exceeded.

Table 3 – Chemical Hazard Evaluation Summary

Chemical Name	PEL/TWA[1]	IDLH[2]	LEL
Benzene	1 ppm	500 ppm	12,000 ppm
Ethylbenzene	100 ppm	800 ppm	11,000 ppm
Toluene	200 ppm	1,000 ppm	12,000 ppm
Xylenes	100 ppm	900 ppm	9,000 ppm
MTBE	40 ppm	2000 ppm	10,000 ppm
Naphthalene	10 ppm	250 ppm	8,000 ppm
2-Methylnaphthalene	N/A	N/A	N/A
1,2,4 - TMB	25 ppm	N/A	N/A
1,3,5 - TMB	N/A	N/A	N/A
Carbon Monoxide	50 ppm	1,200 ppm	N/A
Oxygen	Measure O_2 level - acceptable range 19.5% to 23.5%		

ppm parts per million
N/A not applicable

Breathing Zone Monitoring Procedure

Staffing: Staff selected to conduct the breathing zone monitoring require Hazardous Waste Operations and Emergency Response (HAZWOPER) training in accordance with OSHA 29 CFR 1910.120.

Equipment: Obtain a calibrated PID and four-gas meter. The PID can measure volatile organic compounds (VOCs); the four-gas meter is capable of measuring carbon monoxide and oxygen.

Calibration: Calibrate the PID and the four-gas meter according to the manufacturer's instructions and ensure calibration is up-to-date. Document calibration.

Obtain and record PID and four-gas meter background level with equipment on but not advancing, that is to be used during the subsurface activities. Note weather, wind direction, speed, and temperature. Collect continuous readings for 15 minutes to establish baseline readings.

Sampling Strategy

- Identify and mark the breathing zone locations for workers near the drilling operation.
- Conduct real-time air sampling using the PID in the workers' breathing zone(s).
- Monitor during representative work shifts, focusing on high-risk activities or periods.
- Determine the frequency of monitoring based on the specific work environment, exposure potential, and regulatory requirements.
- Record the results of each monitoring event, including date, time, location, and measured concentrations detected on the PID.
- Maintain accurate records of monitoring results for future reference, compliance reporting, and analysis.

Action Items for Exceeding PEL/TWA

Alerting Workers

- If the measured concentrations of any of the chemicals exceed the PEL/TWA sustained for more than 5 minutes, immediately inform the affected workers.
- Advise workers to take necessary precautions and follow established safety protocols.

Investigation and Control Measures

- Investigate the cause of the elevated concentrations and identify potential sources.
- Implement engineering controls, such as improved ventilation or containment measures, to reduce exposures.
- Review work practices and ensure compliance with established safety procedures.

Medical Evaluation

- Offer medical evaluations, including health assessments, to workers who may have been exposed above the PEL/TWA.
- Provide appropriate medical guidance and follow-up as necessary.

Review and Corrective Actions

- Analyze the monitoring data and review the effectiveness of control measures.
- Take corrective actions to prevent future PEL/TWA exceedances.
- Update the breathing zone monitoring plan and associated protocols, if required.

Action Items for Exceeding IDLH

Immediate Response

- If any of the measured concentrations exceed the IDLH, initiate emergency procedures immediately.
- Safely cease operations
- Evacuate the affected workers to a safe location.
- Provide appropriate medical attention to workers based on the symptoms and severity of exposure.

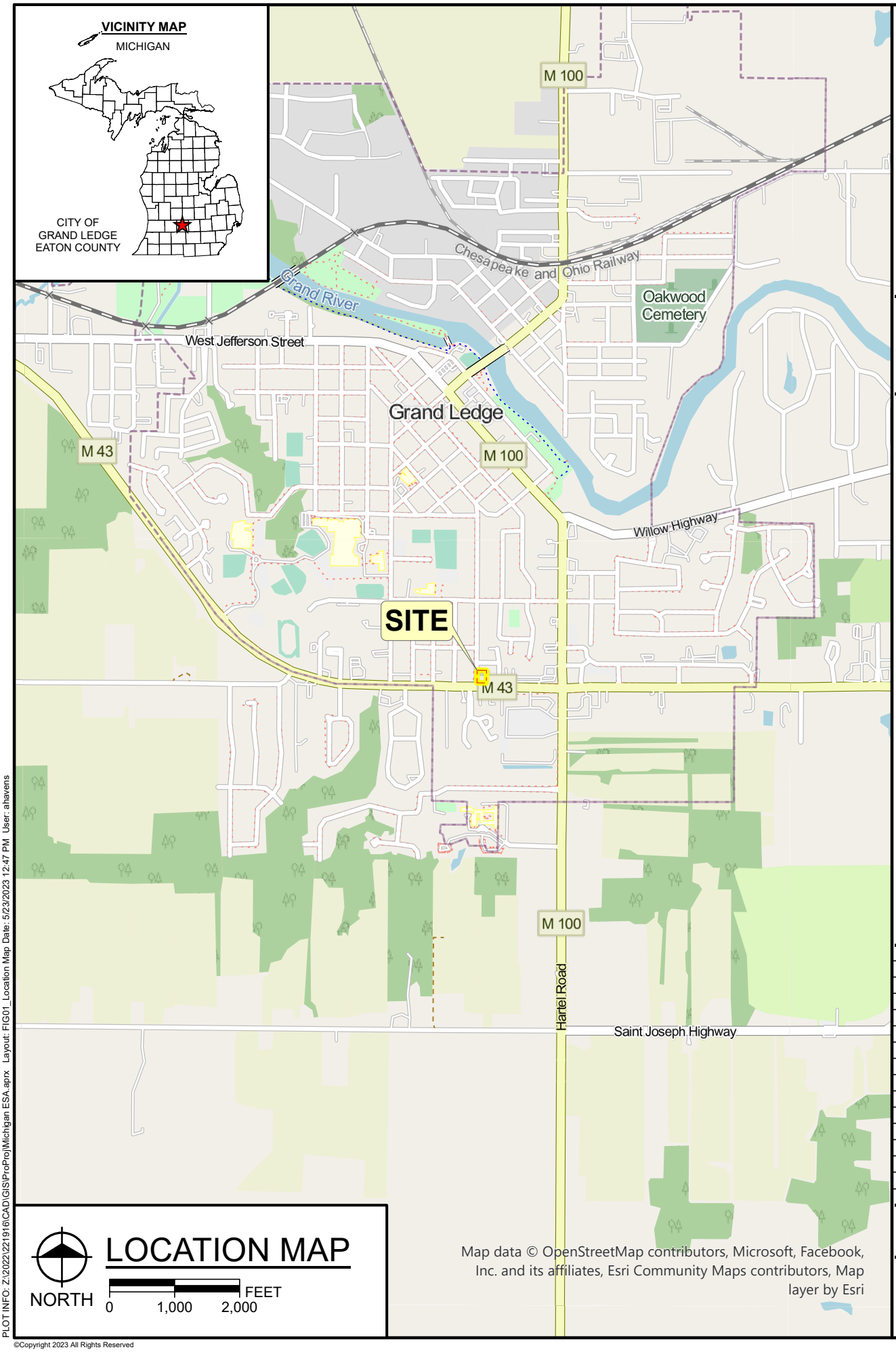
Investigation and Corrective Actions

- Investigate the cause of the IDLH exceedance and take immediate actions to address the situation.
- Implement additional control measures to prevent future IDLH exceedances.
- Conduct a thorough incident investigation to identify lessons learned and prevent recurrence.

Action Items for Exceeding LEL

Immediate Response

- If the measured concentrations of any of the chemicals exceed the LEL, initiate emergency procedures.
- Safely cease operations
- Evacuate the area immediately and ensure the safety of all workers



LOCATION MAP

NORTH

0 1,000 2,000 FEET

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Grand Ledge Tire
505 East Saginaw Highway, Grand Ledge, Michigan
Final Assessment Report

PROJECT NO.
221916

FIGURE NO.
1

PLOT INFO: Z:\2022\221916\CAD\GIS\ProProj\Michigan ESA.aprx Layout: FIG01_Location Map Date: 5/23/2023 12:47 PM User: ahavens

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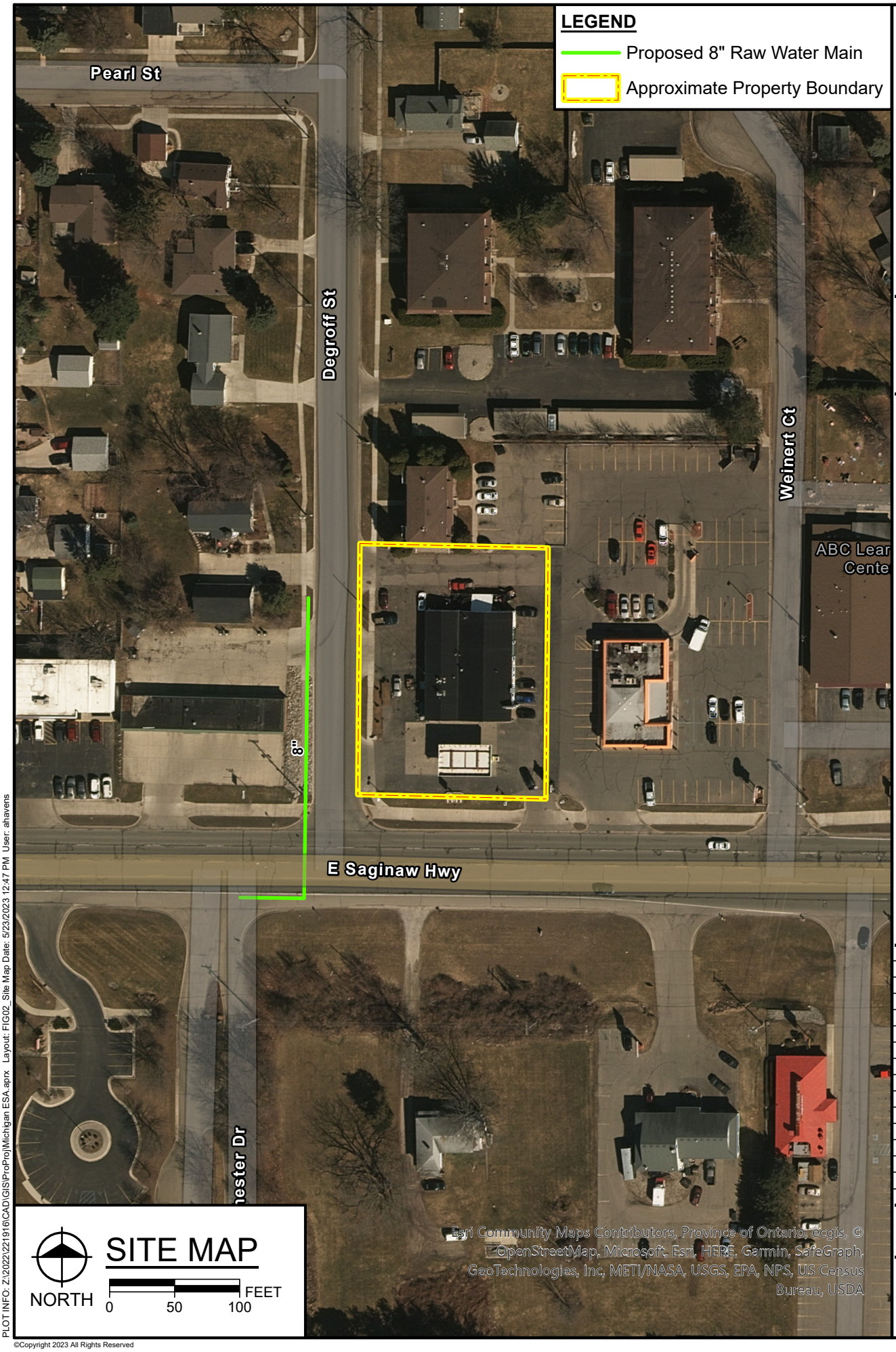

SITE MAP

NORTH

0 50 100 FEET

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505 East Saginaw Highway

Grand Ledge, Michigan

Final Assessment Report

PROJECT NO.
221916

FIGURE NO.
2

PLOT INFO: Z:\2022\221916\CAD\GIS\ProProj\Michigan ESA.aprx Layout: FIG02_Site Map Date: 5/23/2023 12:47 PM User: ahavens

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SECTION 31 23 03 – EXCAVATION AND FILL FOR UTILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the furnishing and installation of the major items listed below:
   1. Excavation and trenching in earth and in rock.
   2. Disposal of items from clearing and unsuitable or excess excavated materials.
   3. Complete drainage of excavations.
   4. Temporary or permanent sheeting, bracing and shoring of excavations.
   5. Installation of normal and special foundations, bedding and backfill materials.

1.3 REFERENCES

A. Except as herein specified or as indicated on the Drawings, the work of this Section shall comply with the following:
   1. ASTM Standard Specifications:
      a. D1556 - Density and Unit Weight of Soil In Place by the Sand-Cone Method.
      b. D1557 - Laboratory Compaction Characteristics of Soil Using Modified Effort.
      c. D2321 – Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
      d. D2922 - Density of Soil and Soil-Aggregate in Place by Nuclear Methods.
   2. State DOT Current Standards:
      a. Specifications for Construction.
      b. Standard Plans.

1.4 DEFINITIONS

A. Terms:
   1. Bedding: The material placed around a utility between 4 inches below to 12 inches above the utility the full width of the trench.
   2. Driving Surface: A pavement, curb, or sidewalk.
   3. Excavation:
      a. Removing the following materials from their present location:
         1) Native below-grade material such as soil, rocks, boulders less than 1/2 cubic yard in volume, and buried trees.
         2) Man-made items such as, but not necessarily limited to:
            a) Bituminous and concrete paving.
            b) Curbs.
            c) Riprap.
            d) Head walls.
            e) Underground utilities.
            f) Manholes and catch basins.
            g) Foundations.
            h) Sidewalks.
   4. Extra Earth Excavation: Excavation of native material from below the normal trench bottom.
   5. Foundation Material: The material placed in a trench undercut to replace extra earth excavation.
   6. Hardpan:
      a. Cemented soil layers.
      b. Is not hard clay layers that are not cemented.
   7. Imported Material: Soil material which is purchased by Contractor and hauled onto the Site.
   8. Native Material: Soil and other natural earth materials, except rock, which are existing on the Site prior to the start of Work.
   9. Normal Trench Bottom: The surface of the undisturbed native material at an elevation 4 inches below the bottom of the utility.

10. Pavement: Any combination of subbase, base course and concrete, bituminous or aggregate surface course, including shoulders, placed on a subgrade. Includes roadways, parking areas, driveways, and bituminous seal coat.
11. Rock Excavation:
    a. Excavation of igneous, metamorphic or sedimentary rock or hardpan which cannot be excavated without continuous drilling and blasting or continuous use of a ripper or other special equipment.
    b. Excavation of boulders of 1/2 cubic yard or more in volume.
12. Special Foundations:
    a. Specially constructed systems for support of underground utilities such as timber piling, concrete foundations and surcharge techniques.
    b. Extra earth excavation and placing imported or native materials are not special foundations.
13. Structure: A building, retaining wall, tank, footing, slab, or other similar construction.
14. Suitable Material:
    a. Native material excavated from the trench and approved as backfill by Engineer or independent testing laboratory.
    b. Not used under or within 1 on 1 slope of driving surfaces or structures.
    c. Placed between the top of the bedding or trench backfill as indicated on the Drawings and the bottom of the surface restoration.
15. Trench Backfill:
    a. The material placed between the top of bedding and the bottom of suitable material, the surface restoration or driving surface, as indicated on the Drawings.
    b. Used under and within 1 on 1 slope of driving surfaces or structures.
16. Utility Structure: Manhole, catch basin, valve chamber, junction chamber, water main valve, or other similar utility appurtenance.
17. Other Definitions: Other earthwork terms not defined herein or in the Contract Documents shall be as defined in state DOT Standard Specifications for Construction.
18. Contaminated Material:
    a. Soils or other material which contain chemical contaminants in excess of federal and state standard for use as fill.
    b. Soils which are not to be used for fill.

~~18.~~19. Hazardous Material: Soils or other materials which may contain chemical contaminants in excess of federal and state standards for disposal in a Type II landfill.

1.5 DESIGN AND PERFORMANCE REQUIREMENTS

A. Trench Bottom Suitability:
1. Be responsible for the suitability of the normal trench bottom in supporting the utility, bedding and backfill.
2. Notify Engineer and await Engineer's decision if a possible unsuitable condition exists.
3. Poor dewatering techniques or lack of excess water control shall not be a reason for additional payment for remedial measures.

B. Trench Wall Stability:
1. Be responsible for the trench configuration, including sheeting, shoring and bracing necessary to support trench side walls from collapsing.
2. Be responsible for the structural design and stability of a pipe-laying box if utilized on the Project to prevent trench walls from collapsing.

1.6 QUALITY ASSURANCE

A. Testing: Testing will be performed in accordance with Division 01 Section "Testing Services for Buried Utilities, Roadways, and Site Projects." and the Contractor’s Quality Control Plan.

B. Compaction:
1. Determine density by the modified Proctor method, ASTM D1557.
2. Compact granular trench backfill and bedding to at least 95% maximum density.
3. Compact suitable backfill material to at least 90% maximum density.
4. The first 12 inches of native material at the bottom of utility trenches:
    a. Test for density.
    b. Compact to at least 95% maximum density (modified proctor) if the existing density is below 95% maximum density (MP).

c. Compact clay soil to at least 98% maximum density in accordance with standard proctor ASTM D698, if below 98% maximum density (SP).

1.7 SUBMITTALS

A. Action Submittals: For imported materials:
   1. Source.
   2. State DOT classification.
   3. Sieve Analysis.

1.8 PROJECT CONDITIONS

A. Dust Control:
   1. Use all legal means necessary to control dust on and near the Work and on and near off-site borrow areas if such dust is caused by Contractor's operations during performance of the Work or if resulting from the condition of the Site when earthwork operations are suspended.
   2. Moisten or otherwise treat haul roads, delivery roads, temporary site access roads and other surfaces as required to prevent dust from being a nuisance to the public, neighbors, and concurrent performance of other work on the Site.
   3. Scrape, broom, or vacuum adjacent streets to remove tracked dirt every Friday afternoon, or more as necessary if directed by Engineer. Utilize vacuum if dust from brooming is excessive in opinion of Engineer.

B. Existing Structures, Utility Structures, and Utilities:
   1. Call MISS DIG to locate existing underground utilities prior to starting excavation.
   2. Where utilities, utility structures or structures are encountered which are in active use:
      a. Provide adequate protection for them.
      b. Be responsible for damage to them.
   3. Provide stand-by utility service if temporary removal is necessary for a period exceeding 2 hours.
   4. Where utility service connections to occupied buildings must be temporarily disconnected, give 48 hours notice to the affected occupants of the time and duration of the anticipated shutoff.
   5. Notify Fire Department 48 hours in advance if water main or fire supply line shutoff is required.
   6. Raise, lower, or move underground utilities, utility structures or structures which interfere with the utility or utility structure being constructed as part of this Work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General:
   1. Approval Required: Material shall be subject to the approval of Engineer or independent testing laboratory.
   2. Notification: For approval of imported material, notify Engineer or independent testing laboratory at least 1 week in advance of intention to import material, designate the proposed borrow area, and permit Engineer or independent testing laboratory to sample as necessary from the borrow area for the purpose of making acceptance tests to prove the quality of the material.

B. Material Sources and Uses:
   1. Imported Material:
      a. Foundation material.
      b. Bedding.
      c. Pea stone.
      d. Trench backfill.
   2. Native material unless quantity is not sufficient; then shall be imported material: Suitable material.

C. Foundation Material for Crushed Stone: 1-1/2-inch maximum size.

D. Bedding:
   1. For Pipes Less Than 36 Inches:
      a. MDOT 902 Granular Material Class II modified to 100% passing a 1/2-inch sieve
   2. For Pipes 36 Inches and Larger:
      a. Pea stone bedding to spring line.
      b. Geotextile filter fabric over pea stone.
      c. MDOT Granular Material Class II to 1 foot above pipe.
   3. For Utility Structures:
      a. Sand gravel fill of such gradation that 100% will pass a 1/2-inch sieve and not more than 10% by weight is lost by washing, or
      b. MDOT 902 Granular Material Class II modified to 100% passing a 1/2-inch sieve.

E. Pea Stone: Clean stone with 100% passing a 3/8-inch sieve and 100% being retained on a No. 8 sieve.

F. Trench Backfill: MDOT 902 Granular Material Class II.

G. Suitable Material:
   1. Native Material Which is Used as Backfill:
      a. Exclusive of gray or blue clay, peat, organic matter, or frozen lumps.
      b. Containing no rocks or lumps over 3 inches in greatest dimension.
      c. Having a moisture content such that material is capable of being compacted to 90% maximum density.
   2. MDOT 902 Granular Material Class II if native material is not adequate in opinion of Engineer.

2.2 OTHER MATERIALS

A. Other materials, not specifically described but required for proper completion of the work of this Section, shall be as selected by Contractor subject to the approval of Engineer or independent testing laboratory.

PART 3 - EXECUTION

3.1 GENERAL

A. Excavating, Backfilling and Compacting:
   1. For Utility Structures: In accordance with this Section.

B. Obstructions:
   1. Remove and dispose of buried trees, rocks, boulders, driving surfaces, pipes and the like, as required for the performance of the Work.
   2. Exercise care in excavating around catch basins, inlets and manholes.
   3. Avoid removing or loosening castings.
   4. Repair and replace damaged or displaced castings; remove dirt entering utility structures during the performance of the Work at no additional cost to Owner.

C. Cutting Paved Surfaces and Similar Improvements:
   1. Cut pavement prior to excavating.
   2. Cuts shall be a minimum of 1-foot wider than trench on each side. When the remaining width of paved surface is less than 4 feet, remove the entire paved surface.
   3. Before removing pavement, mark the pavement neatly, paralleling pipe lines and existing street lines. Space the marks the width of the trench.
   4. Concrete:
      a. Pavements: Saw cut if over 3 feet from expansion or construction joint, otherwise remove to joint.
      b. Sidewalks: Remove to joints.
      c. Curb and Gutter: Remove to joints.
   5. Final Surface Course Bituminous: Saw cut joints unless otherwise approved by Engineer.
   6. Do not disturb or damage the adjacent pavement. If the adjacent pavement is disturbed or damaged, remove and replace the damaged pavement.
   7. Contractor may tunnel under curbs that are encountered. Replace curb disturbed by construction.
   8. Dispose of materials removed.

D. Utilities to be Abandoned:
   1. When pipes, conduits, sewers or utility structures are removed from the trench leaving dead ends in the ground, fully plug such ends with brick and mortar.
   2. Entirely remove abandoned utility structures unless otherwise specified or indicated on the Drawings.
   3. Remove from the excavation materials which can be readily salvaged and store on the Site.
   4. Salvageable materials will remain the property of Owner unless otherwise indicated by Owner.

E. Extra Earth Excavation:
   1. If soft material, which in the opinion of Engineer or independent testing laboratory is not suitable, is encountered below the normal trench bottom or below a utility structure Engineer may order the removal of this soft material and its replacement with specified material in order to make a suitable foundation for the construction of the utility or utility structure.
   2. Extra earth excavation made at the order of Engineer will be paid for on the basis of the actual quantity of material excavated. Do not proceed further until instructions are received and necessary measurements made for purposes of establishing additional volume of excavation.
   3. No extra payment will be made if removal is required as a result of poor dewatering techniques.
   4. Special foundations shall be determined on an individual basis by Engineer in cooperation with Contractor, unless otherwise provided in the Contract Documents.

3.2 EXCAVATION AND TRENCHING

A. General:
   1. By open cut from surface unless designated otherwise.
   2. Slope sides of trench adequately for protection of the Work and safety of workers.

B. Maximum Length of Open Trench: 200 feet.

C. Width:
   1. Minimum Clearance on Each Side of Utility:
      a. To 16 Inches Diameter: 8 inches.
      b. Greater Than 16 Inches Diameter: Pipe outside diameter times 1.25 plus 12 inches.
   2. Maximum Width of Trench at Top of Bedding:
      a. Up Through 30-Inch Diameter Utility: 16 inches plus utility diameter.
      b. Greater Than 30-Inch Diameter Utility: 24 inches plus utility diameter.
   3. Maximum Width of Trench at Ground Surface:
      a. Not outside of the property line or easement.
      b. As required for protection of the Work and safety of workers.
      c. Use sheeting, bracing and shoring if required.
   4. Provide sufficient space in the trench to permit the joint to be properly made.

D. Depth:
   1. Excavate to provide the elevations, grades, and depths of cover indicated on the Drawings and herein specified.
   2. The 4 inches of required bedding material below the utility may be omitted if:
      a. Approved by Engineer.
      b. Contractor arranges and pays for testing of the native material.
      c. The native material complies with MDOT 902 Granular Material Class II material, modified so that 100% passes a 1/2-inch sieve.
      d. The material is compacted as specified herein.
   3. Excavate to the normal trench bottom elevation with an accuracy of ± 0.10 feet.

E. Rock Excavation:
   1. Where rock excavation is encountered within the excavation, expose the surface of the rock sufficient to permit adequate measurements to be taken before the rock excavation is started.
   2. Notify Engineer prior to removal if rock is encountered.
   3. No utility shall be within 6 inches of rock.
   4. Blasting:
      a. Only with permission of Engineer and in accordance with laws and regulations applying thereto.
      b. Secure permit if required.
      c. Notify utility and public agencies.
      d. Explosives shall be used with extreme care by experienced workers only.

e. Hours shall be fixed by Engineer.
f. Contractor solely responsible for safety, damage and control of blasting operations.

F. Bedding:
1. Place the bedding material up to 1/8 the height of the utility. Compact as herein specified.
2. Accurately shape the bedding material to fit the pipe shape. Recess the bedding to relieve the pressure on the bell or other projecting utility joint.
3. After laying out the utility, tamp additional bedding in place up to the midpoint of the utility. Use hand-operated compactors to achieve the required compaction.
4. Place additional bedding up to 12 inches above the top of the utility. Use hand operated compactors to achieve required compaction.
5. Place bedding in maximum lifts of 10 inches.
6. No payment shall be made for aggregate or stone bedding when used for Contractor convenience.

G. Trench Backfill:
1. Use backfill material as each Drawing detail indicates and as the material is defined herein.
2. Place backfill in 8 to 10-inch lifts and compact as herein specified. Engineer will consider greater lifts if testing indicates that the required compaction is being achieved.

H. Utility Structures:
1. Place and compact specified bedding below utility structures.
2. Backfill around utility structures shall be of the same type backfill as that required for the trench in accordance with these Contract Documents.
3. Place backfill in 8 to 10-inch lifts and compact as herein specified.

3.3 DISPOSAL OF EXCESS EXCAVATED MATERIAL

A. General: Contractor responsibility and expense.

B. Disposal Sites:
1. Material desired by Owner shall be disposed of by Contractor in the following priority order:
a. At locations designated by the Contract Documents.
b. At locations on or within 2 miles of the Project Site designated by Owner after construction starts.
c. At locations on the Project Site by written arrangement with individual property owners.
d. Owner may choose not to accept certain materials, including but not necessarily limited to, items from clearing, muck, peat, marl and whole or broken man-made items removed by construction.
2. Material not desired by Owner shall be disposed of in a location of the Island determined by Contractor.
3. Disposal of materials shall not violate laws, rules, regulations and the like regarding the filling of flood plains, wetlands and other environmentally sensitive areas.
4. Provide adequate controls to maintain disposal sites in a neat and safe condition by periodic leveling of material, and such other practices as are necessary.
5. Provide soil erosion control measures necessary to prevent soil erosion and sedimentation of wetlands, rivers, ditches, or similar low lying areas.

3.4 EXCESS WATER CONTROL

A. Regulations and Permits: Comply with soil erosion control permit in accordance with Mich. P.A. 451, Part 91 of 1994, the Natural Resource and Environmental Protection Act, and all pertinent rules, laws, and regulations.

B. Unfavorable Weather:
1. Do not place, spread or roll fill material during unfavorable weather conditions.
2. Do not resume operations until moisture content and fill density are satisfactory to Engineer or independent testing laboratory.

C. Pumping and Drainage:
1. Provide, maintain and use at all times during construction adequate means and devices to promptly remove and dispose of water from every source entering the excavations or other parts of the Work.
2. Dewater by means which will ensure dry excavations, preserve final lines and grades, and do not disturb or displace adjacent soil. Use wells, portable pumps, temporary underdrains, or other methods as necessary.

3. Perform Pumping and Drainage:
   a. In such a manner to cause no damage to property or structures and without interference to the rights of the public, owners of private property, pedestrians, vehicular traffic, or the work of other contractors.
   b. In accordance with pertinent laws, rules, ordinances, and regulations.
4. Do not overload or obstruct existing drainage facilities.

D. General:
1. Keep excavations dry during construction.
2. Remove water by use of wells, well points, portable pumps, bailing, drains, underdrains or other acceptable methods.
3. Provide crushed stone or gravel as required to aid dewatering operations.
4. Divert or temporarily reroute existing sewers and drainage of discharge lines to adequate and acceptable outlets during construction. Contractor responsible to ascertain availability of outlets.
5. Divert surface water from entering excavations by construction and maintenance of channels or berms.
6. Sediment traps and other soil erosion control measures shall prevent soil particles from entering any sewer, watercourse or similar conveyance.
7. Protect utilities, utility structures, and structures, existing and new, from hydrostatic uplift.

3.5 DISPOSAL OF CONTAMINATED SOILS

A. General:
1. Soils which are to be excavated within the HAA are suspected of being contaminated.
2. Engineer will determine which soils are potentially contaminated.

B. Potentially Contaminated Soils:
1. Remove from trench.
2. Transport to stockpile area located on Owner's property on [ ].
3. Stockpile on top of an 8 mil PVC liner in accordance with EGLE requirements.
4. Cover with an 8 mil PVC liner in accordance with EGLE requirements.
5. Maintain PVC liner at all times.
6. Keep separate and stockpile separately soils removed from different areas.
7. Engineer will obtain a representative sample of soil from each stockpile and have necessary analytical tests performed as necessary for landfill disposal. Owner will pay for tests.

C. If soils are determined to be contaminated:
1. Transport soils to the to be determined Landfill, located at within 30 miles from Site.
2. Owner will pay landfill disposal fees.

D. If soils are not determined to be contaminated: Grade smooth at stockpile area once all construction has been completed.

E. If soils are determined to be hazardous: Owner will arrange and pay for hazardous material handler to contain and dispose of materials.

~~3.5~~3.6 SHEETING, SHORING AND BRACING EXCAVATIONS

A. General:
1. Furnish, put in place and maintain sheeting, bracing and shoring as may be required to properly support the sides of excavations and to prevent movement of earth which could in any way injure the Work or adjacent property.
2. Exercise care in the removal of sheeting, shoring, bracing and timbering to prevent collapse or caving of the excavation faces being supported and damage to the Work and adjacent property.
3. A pipe-laying box may be used in lieu of sheeting.

B. Sheeting:
1. Do not install by jetting.
2. Remove as backfilling proceeds, unless ordered left in place by Engineer. Use care to fill and compact voids created by removal, especially below mid-height of utility.

3. Sheeting Left in Place:
   a. Requires written approval of Engineer.
   b. Cut off minimum of 2 feet below finished grade.

~~3.6~~3.7 CLEANUP

A. Upon completion of the work of this Section, remove all excess excavated material, trash, and debris resulting from construction operations. Remove equipment and tools. Leave the Site in a neat and orderly condition acceptable to Engineer.

END OF SECTION 31 23 03

SECTION 33 05 30 – UTILITY HORIZONTAL DIRECTIONAL DRILLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the design, furnishing and installation of a pipe crossing under a street or highway, without disturbing the surface, except at entry and exit points.

1.3 REFERENCES

A. Except as herein specified or as indicated on the Drawings, the work of this Section shall comply with the following:
   1. ASTM Standard Specifications:
      a. D2321 – Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and other Gravity-Flow Applications.
      b. D2774 - Underground Installation of Thermoplastic Pressure Pipe.
      c. D3261 - Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
      d. D3350 - Polyethylene Plastics Pipe and Fittings Materials.
      e. F1962 - Guide for Use of Maxi-Horizontal Directional Drilling for Placement of Polyethylene Pipe or Conduit Under Obstacles, Including River Crossings.
   2. AWWA Standards and Manuals:
      a. C104/A21.4 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
      b. C105/A21.5 - Polyethylene Encasement for Ductile-Iron Piping for Water and Other Liquids.
      c. C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings.
      d. C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds for Water or Other Liquids.
      e. C150/A21.50 - Thickness Design of Ductile-Iron Pipe.
      ~~a.~~f. C906 - Standard for Polyethylene (PE) Pressure Pipe and Fittings, 4 In. (100 mm) Through 63 In. (1,575 mm), for Water Distribution and Transmission
      ~~b.~~g. M55 – PE Pipe – Design and Installation.
   3. State DOT Current Standards:
      a. Specifications for Construction.
      b. Standard Plans.
      c. Special Provisions for Horizontal Directional Drilling.

1.4 DESIGN AND PERFORMANCE REQUIREMENTS

A. Minimum Requirements:
   1. The requirements herein and indicated on the Drawings are minimum requirements.
   2. Product pipe shall be minimum internal diameter of 7.25-inches and designed to withstand a minimum internal working pressure of 125 psi at elevation 785 with an additional minimum surge allowance of 50% of the working pressure. External pressures and loads shall not be used to offset internal design pressures.
   3. Select equipment necessary to provide the indicated finished product in the conditions present at the Site.
   4. If, in the opinion of the Contractor, additional geotechnical investigation is required for the design to define the soil conditions, the Contractor shall obtain additional geotechnical information at no cost to the Owner.
   5. No claim for unforeseen condition will be permitted.
   6. Design shall be performed by an engineer licensed in the state that the work occurs.
   7. Review of submittals by Engineer does not relieve Contractor from responsibilities under this specification.

1.5 SUBMITTALS

A. Delegated Design Action Submittals:
1. Calculations and drawings to support and identify the pipe class, installation, thrust and tensile forces, and proposed pipe.
2. Calculations and methods for buoyancy modifications during pull back.
3. Transition fittings at changes in pipe material.
4. Horizontal and vertical alignment drawing of the pilot hole at the same scale as the Drawings.
5. Equipment and materials staging plan, including traffic control.
6. Method for directional drill.
7. Pullback and torque capacity of drill rig(s).
8. Equipment and method for monitoring the location of the drill head.
9. Project workplan and schedule.

B. Informational Submittals:
1. Evidence of current licensure of design engineer in the state in which the work will occur.
2. Provide a log of the following information:
   a. Drill head location.
   b. Axial and torsional loads.
   c. Drilling fluid discharge rate and pressure.
3. Pipe Manufacturer material certifications.
4. Information on drilling fluids to be used.
5. For HDPE pipe, submit pipe Manufacturer's sworn and notarized statements that Contractor has been trained and certified in the handling and joining of the pipe Manufacturer’s materials.

C. Close-Out Submittals:
1. After completion of the directional drilling operation, provide an as-built drawing.
2. Drawing to Include:
   a. Scale: Same as Drawings.
   b. Tabulation of pipeline depth at 25-foot intervals referenced to a stationed alignment located above the pipe.
   c. Tabulation of horizontal alignment points at 25-foot intervals with points being either witnessed to two permanent landmarks or based upon a surveyed and documented coordinate system.

1.6 QUALITY ASSURANCE

A. Installation Personnel Qualifications:
1. Trained and experienced in the use of directional drilling equipment and installation of the materials, for the specific application of Project.
2. Knowledgeable of the design and in down hole drilling, impact of drilling in various geological formations, sensing and recording instrumentation and interpreting computer printout data.
3. Experienced in a minimum of 5 installations of similar or greater complexity and under similar conditions in the last 5 years.
4. The designated Project superintendent shall be present at the Site during work at the Site. Contractor shall not change Project superintendent without written notice to Owner a minimum of 5 working days in advance of the change. Written notice of change shall include detailed information and rationale for staffing change.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Product Pipe:
1. Allowable Pipe Materials: HDPE and Ductile Iron.
2. HDPE Pipe:
   a. Ductile Iron Pipe Size (DIPS), DR 11 (200 psi)
   b. Material Minimums:
      1) High density polyethylene pipe compound molecular weight of 0.941.
      2) Material Designation: PE 4710.
      3) Material Classification: Type III, Class C, Category 5, Grade P34; ASTM D1248.
      4) Cell Classification: ASTM D3350 445574C/E, PE 4710.

5) Manufacturing Standard: ASTM D3350.
6) Pipe shall contain no recycled compounds except that generated in the Manufacturer's own plant from resin of the same specification from the same raw material.
7) Blue Stripe

c. Manufacturers: Poly Pipe, Inc., Performance Pipe, ISCO Industries; or equal.
d. Butt fused joints using equipment and methods in strict accordance with the pipe Manufacturer's recommendations and ASTM D3261 and ASTM D2657.
e. HDPE Fittings:
1) ASTM D3261.
2) Molded or fabricated from polyethylene compound having a cell classification equal to or exceeding the cell classification of the pipe.
3) Molded Fittings: Pressure rated to match the pipe SDR pressure rating to which they are connected.
4) Fabricated Fittings:
a) Made from pipe with a pressure rating at least 25% greater than the pipe to which they are connected.
b) Angle of bends to have tolerance of ± 1% of required angle.
f. Pipe Joining:
1) Pipe to Fitting Joining: Butt fused using equipment and methods in strict accordance with the pipe Manufacturer's recommendations.
2) Joining Segments of Fabricated Fittings: Butt fused using equipment and methods in strict accordance with the pipe Manufacturer's recommendations.
g. Transitions from HDPE Pipe to Other Materials:
1) AWWA C906.
2) Mechanical joint adapter.
3) Obtain Engineer's review.
4) Manufacturers: Phillips Driscopipe, Inc.; Chevron Chemical Company; Plexco; or equal.

3. Ductile Iron Pipe:
a. ANSI/AWWA C150/A21.50 and C151/A21.51.
b. Class: 52.
c. Cement Mortar Lining:
1) ANSI/AWWA C104/A21.4.
2) Double thickness.
d. Meet the requirements of ANSI/NSF Standard 61 and the certification must be stamped on the exterior wall of the pipe.
e. Joints:
1) ANSI/AWWA C111/A21.11.
2) Restrained:
a) 6-Inch Through 24-Inch:
(1) U.S. Pipe: TR Flex Restrained Joint.
(2) American: Flex-Ring Restrained Joint.
f. Lubricant: Provide in accordance with Manufacturer's recommendation.
g. Gasket: Nitrile (NBR).
h. Polyethylene Encasement.

~~3.~~4. Product Pipeline Design: Based on Site conditions, performance criteria, and Contractor's means and methods.
~~4.~~5. Entire pipe line shall meet the same design requirements. Pipe segments with different design criteria will not be allowed without written approval of the Engineer and Owner.

B. Drilling Fluids:
1. Organically inert.
2. Fluid composition shall comply with applicable environmental regulations.
3. Select drilling fluid appropriate for conditions encountered at the Site.

C. Casings:
1. At no additional cost to Owner, install casings as needed for the completion of the work or for protection of existing facilities, utilities, properties, and structures.

D. Detection Wire:
1. Copper wire, solid or braided, with coating to prevent oxidation and deterioration.
2. Minimum Gage: 12 AWG.
3. Secure 2 separate wires to outside of product pipeline.

E. Staging Area Fencing:
   1. Orange, plastic safety fence supported by steel fence posts.
   2. Minimum Height: 4 feet.
   3. Maximum Fence Post Spacing: 8 feet.
   4. No vertical sags greater than 6 inches between posts.

F. Water: Contractor shall be responsible for supplying water required for the work.
   1. Water required for the performance of the work may be obtained through the municipal water supply system. Contractor shall coordinate and pay for temporary connections and usage fees.

PART 3 - EXECUTION:

3.1 LINE AND GRADE

A. Pilot Hole Alignment:
   1. Submit pilot hole alignment data for review prior to reaming and pipe installation.
      a. Alignment data is required to ensure compliance with alignment tolerance performance criteria.
      b. Alignment data submittal review does not relieve the Contractor of responsibility for determining adequate cover for drill fluid containment or other design considerations.
   2. Follow the grade as submitted by Contractor and reviewed by Engineer.
      a. Minimum Cover: 5.5 feet at ends and 10 feet elsewhere along pipeline unless otherwise indicated on the Drawings.
      b. Alignment shall be uniform and not include high points greater than 25% of the pipe's inside diameter.
   3. Lines and grades shall be established in the field by Contractor and reviewed by Engineer.
   4. Provide Engineer with a tabulation and plot of the pilot hole coordinate data at 25-foot intervals referenced to a datum line located above the entrance and exit elevations of the drill.

B. Final Product Pipeline:
   1. Unless otherwise constrained by right-of-way or easement limitations, allowable alignment deviation shall be as follows:
      a. At Locations More Than 50 Feet From Each End:
         1) Horizontal: 5 feet.
         2) Vertical: 5 feet.
      b. At Locations Within 50 Feet From Each End:
         1) Horizontal: 2 feet.
         2) Vertical: 0.5 feet

3.2 STAGING AREAS

A. Drill Staging Area:
   1. Disturb as little area as possible while providing adequate area for workers and equipment.
   2. Keep area neat and orderly.
   3. Install and maintain staging area fencing around perimeter.

B. Pipe Staging Area:
   1. Disturb as little area as possible while providing adequate area for workers and equipment and to string, assemble, and inspect pipe.
   2. Keep area neat and orderly.
   3. Install and maintain staging area fencing around perimeter.
   4. Provide protection of exposed ends of pipe to prevent entry by children and animals.

C. Establish and maintain within right-of-way and easement boundaries identified by Owner.

D. Restore to original grade and condition after completion of work.

3.3 INSTALLATION

A. General:
1. Install pilot hole and pipe in conformance with the reviewed submittals.
2. Minimize subsurface disruption during drilling and pullback operations, including the setting of casings if necessary due to Site conditions or Contractor's operations.
3. During pilot hole installation, notify Engineer immediately if partial or full blockage is encountered.
4. Complete operation as expeditiously as possible.
5. Disposal:
   a. Locate an acceptable site for disposal of drilling fluids and excess soils resulting from drilling operation.
   b. Be responsible for transport of materials to and from the Site to the disposal area as well as disposal costs.
   c. Disposal shall comply with applicable environmental and right-of-way regulations.
6. Install and maintain measures to protect existing utilities and physical features from damage during the Project, including but not limited to damage caused by equipment, settlement, or vibration.

B. Vibration and Noise:
1. Limit vibration to a maximum of 0.2 inches/second on each nearby structure. Provide continual vibration monitoring, maximum of 1 minute data point intervals, on or adjacent to structures affected during activities which may exceed this limit. Provide Engineer with copy of data log.
2. Limit sound levels to a maximum of 67 dB(A) during non-working hours as measured at nearby occupied structures. Sound levels during working hours shall conform to local regulations, or industry standards if no local regulations exist.

C. Heaving and Settlement:
1. Actively monitor for signs of heaving and settlement during drilling operations.
2. Include settling control points on the surfaces or structures as specified below and survey their elevation on a daily basis:
   a. Structures adjacent to the work that may be impacted depending on distance from the drilling operation.
   b. Control points at the intersection of M-43 (W. Saginaw Highway) and Degroff Street including the centerline of M-100 and each edge of the roadway.
   c. Control points at the intersection of M-100 (E. Jefferson Street) and Franklin Street including the centerline of M-100 and each edge of the roadway.
   d. Other points as determined in the field by Engineer.
   e. Other points as required by Contractor.
3. Readings shall be taken with an optical or laser level with an accuracy of ±0.01-foot.

D. Drilling Fluids:
1. Source:
   a. Supply materials required for drilling fluids , including but not limited to water .
2. Inadvertent Returns:
   a. Minimize drilling fluid returns at locations other than drilling entry and exit points.
   b. Immediately clean up inadvertent returns.
   c. Be responsible for paying for costs and obtaining permits required for cleanup efforts.
   d. Be responsible to repair damage caused by inadvertent returns.
   e. Be responsible to repair, clean up, or replace , including temporary water supply required water supply wells affected by inadvertent returns.
3. Containment:
   a. Ensure that equipment is in working order to prevent leakage.
   b. Provide protective measures on the Site to prevent migration of drilling fluids out of the staging areas.
   c. Immediately remove and clean-up drilling fluids outside of the containment areas.
   d. Protect adjacent waterways and storm water facilities from drill fluid contamination.

E. Drill Head Locating:
1. Establish method for determining the location of the advancing drill head.
2. Calculate and plot true vertical depth, horizontal distance and right and left bearing drift.
3. Verify drill head location at least every 25 feet.

F. Pre reaming:
   1. Determine if pre reaming is required.
   2. If prereaming is performed:
      a. Determine required diameter to minimize subsurface disruption and allow unhindered pullback of the product pipeline.
      b. Ensure that annular space around product pipeline is stabilized to prevent settlement.
   3. During the operation, monitor the movement of the reaming head to ensure the hole is free of obstructions along the walls which could reduce the cross section of the installed pipe or which may hinder the pullback of the product pipeline.

G. Placement of Pipe:
   1. Pull Back:
      a. Use appropriate connection equipment between product pipeline and pullback pipe to eliminate transfer of rotational forces to product pipeline.
      b. Support pipe as required to ensure a smooth, freely moving pull back.
      c. Control and limit tensile load on the pipe by devices such as hydraulic pressure regulators or load sensors.
      d. The maximum tensile load on the pipe shall not exceed the maximum allowable load recommended by the pipe Manufacturer.
   2. Detection Wire:
      a. Secure the detection wire to the outside of the pipe to prevent the wire from being dislodged, broken, or stretched during pullback.
      b. Pull detection wire along with the pipe.

3.4 CLEANING

A. Prior to testing, clean pipe using appropriately sized cleaning swabs. Provide containment, filtering, and disposal required for discharge water. Repeat cleaning swab passes as necessary to remove residual soil and drilling fluid contaminants from the pipeline. Multiple swabs may be run in series at the Contractor's option.

3.5 TESTING

A. Pre-Installation Testing:
   1. Conduct low pressure air test prior to pull-back operation.
   2. Restrain piping and components against uncontrolled movement.
   3. Pressurize to a minimum of 4.0 psi and maintained for a minimum of 2 hours.
   4. Check joints by swabbing with a mild soap solution.
   5. Leaking joints shall be removed and pipeline re-joined in accordance with Manufacturer's recommendations.

B. Post Installation Deflection Testing:
   1. Gage Outside Diameter: Not less than 95% of maximum inside pipe diameter with allowance for weld bead thickness.
   2. Allowable Maximum Deflection: 5% of diameter.
   3. Pull Go-No-Go Gage Through Each Section:
      a. Pulled by one person with no mechanical advantage.
      b. Pulled with mechanical advantage:
         1) Utilize pullback force monitoring and recording device capable of continuous recording and minimum force accuracy of 0.5 pounds.
   4. Go-No Go Gage indicates greater than 5% deflection:
      a. Remove and replace section. Undamaged pipe may be reused.
      b. Vibratory Rerounding Device:
         1) Use not permitted.

C. Post Installation Hydrostatic Pressure Testing:
   1. Restrain piping and components against movement.
   2. Fill pipe and ensure removal of any air.
   3. Subject pipe to minimum test pressure of 150% of the system design pressure for a period of 4 hours to expand the pipe, adding water as necessary to maintain the test pressure.
   4. At the end of the 4 hour expansion phase, decrease the test pressure by 10 psi and discontinue adding water.

5. The pipeline must hold the reduced test pressure without the addition of water for a period of 1 hour. Any pressure reduction greater than 5% of the reduced test pressure is considered a failing test.
6. Under no circumstances shall the total time under test exceed 8 hours. If the test is not complete within this time limit, the test section shall be permitted to relax for 8 hours prior to the next test sequence.

D. Complete Pressure, Leak Tests, Disinfection, Flushing, and Bacteriological Testing in accordance with Division 33 “Water Utilities” requirements.

END OF SECTION 33 05 30

SECTION 33 10 00 – WATER UTILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the furnishing and installation of a water distribution system.

1.3 REFERENCES

A. Except as herein specified or as indicated on the Drawings, the work of this Section shall comply with the following:
   1. ASTM Standard Specifications:
      a. A48 - Grey Iron Castings.
      b. A126 - Grey Iron Castings for Valves, Flanges, and Pipe Fittings.
      c. A167 - Standardized Specification for Stainless and Heat-Resistant Chromium-Nickel Steel Plate, Sheet, and Strip.
      d. A240 - Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels.
      e. B62 - Composition Bronze or Ounce Metal Castings.
      f. B88 - Seamless Copper Tube.
      g. C478 - Precast Concrete Manhole Sections.
      h. C923 -Standard Specification for Resilient Connectors Between Reinforced Concrete manhole Structures, Pipes, and Laterals.
      i. D429 - Rubber Property-Adhesion to Rigid Substrates.
      j. D449 - Asphalt Used in Dampproofing and Waterproofing.
      k. D1248 - Polyethylene Plastics Molding and Extrusion Materials.
      l. D1784 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
      m. D1785 - Standardized Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedule 40, 80 and 120.
      n. D2657 – Standard Practice for Heat Fusion Joining of Polyolefin Pipe.
      o. D2774 - Underground Installation of Thermoplastic Pressure Pipe.
      p. D3035 - Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter.
      q. D3139 - Standard Specification for Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals.
      r. D3261 - Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
      s. D3350 - Polyethylene Plastics Pipe and Fittings Materials.
      t. F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
      u. F714 – Standard Specification of Polyethylene (PE) Pipe (SDR-PR) Based on Outside Diameter.
      v. F1668 – Standard Guide for Construction Practices for Buried Plastic Pipe.
      w. F2164 - Standard Practice for Field Leak Testing of Polyethylene (PE) Pressure Piping Systems Using Hydrostatic Pressure.
      x. F2206 – Standards Specification for Fabricated Fittings of Butt-Fused Polyethylene (PE Plastic Pipe, Fittings, Sheet Stock, Plate Stock or Block Stock.
      y. F2620 – Standard Practice for Heat Fusion of Polyethylene Pipe and Fittings.
   2. ANSI/AWWA:
      a. C104/A21.4 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
      b. C105/A21.5 - Polyethylene Encasement for Ductile-Iron Piping for Water and Other Liquids.
      c. C110/A21.10 - Ductile-Iron and Gray-Iron Fittings, 3-inch through 48-inch, for Water and Other Liquids.
      d. C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings.
      e. C150/A21.50 - Thickness Design of Ductile-Iron Pipe.

f. C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds for Water or Other Liquids.
g. C153/A21.53 - Ductile-Iron Compact Fittings, 3-inch through 24-inch (76 mm through 610 mm), and 54-inch through 64-inch (1,400 mm through 1,600 mm) for Water Service.
h. C301 - Prestressed Concrete Pressure Pipe, Steel-Cylinder Type, For Water and Other Liquids.
i. C304 - Design of Prestressed Concrete Cylinder Pipe.

3. AWWA Standards/Manuals:
   a. C502 - Dry-Barrel Fire Hydrants.
   b. C504 - Rubber-Seated Butterfly Valves.
   c. C506 - Backflow Prevention Devices - Reduced Pressure Principle and Double Check Valve Type.
   d. C511 - Reduced Pressure Principle Backflow Prevention Assembly.
   e. C512 - Standard for Air Release, Air/Vacuum and Combination Air Valves for Waterworks.
   f. C515 - Reduced Wall, Resilient Seated Gate Valves for Water Supply Service.
   g. C550 - Standard for Protective Epoxy Interior Coating for Valves and Hydrants.
   h. C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.
   i. C605 - Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water.
   j. C651 - Disinfecting Water Mains.
   k. C700 - Cold Water Meters - Displacement Type, Bronze Main Case.
   l. C701 - Cold Water Meters - Turbine Type for Customer Services.
   m. C702 - Cold Water Meters - Compound Type.
   n. C706 - Direct-Reading, Remote-Registration Systems for Cold Water Meters.
   o. C800 - Underground Service Line Valves and Fittings.
   p. C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4-inch through 12-inch, for Water.
   q. C905 - Polyvinyl Chloride (PVC) Water Transmission Pipe, Nominal Diameters 14-inch through 36-inch
   r. C906 - Standard for Polyethylene (PE) Pressure Pipe and Fittings, 4-inch through 63-inch for Water Distribution.
   s. M23 - PVC Pipe - Design and Installation.
   t. M55 – PE Pipe – Design and Installation.
4. DIPRA - Ductile Iron Pipe Research Association.
5. NFPA – National Fire Protection Association.
6. National Sanitation Foundation (NSF) Standards:
   a. 14 – Plastic Piping System Components and Related Materials.
   b. 60 - Drinking Water Treatment Chemicals.
   c. 61 - Drinking Water System Components.

1.4 DEFINITIONS

A. Abbreviations:
   1. DI - Ductile iron.
   2. HDPE – High Density Polyethylene Pipe.

1.5 SUBMITTALS

A. Action Submittals:
   1. Product Data:
      a. Pipe.
      b. Gaskets.
      c. Hydrants.
      d. Valves.
      e. Thrust control materials.
      f. Corporation stops.
      g. Curb box.
      h. Curb stop.
   2. Procedures: For flushing, pressure testing and chlorinating. Required Information:
      a. Equipment.
      b. Methods.

B. Informational Submittals: Submit Manufacturer's sworn and notarized statements that the materials furnished comply with this Specification.

1.6 QUALITY ASSURANCE

A. Installation Personnel Qualifications:
   1. Trained and experienced in the installation of the materials.
   2. Knowledgeable of the design and the reviewed Shop Drawings.

B. Water Distribution System: Pressure and leak tests.

C. Water Quality: Bacteriological tests.

1.7 PROJECT CONDITIONS

A. Scheduling of Water Shutoffs:
   1. Approval required.
   2. Not to exceed 4 hours, unless otherwise approve by the Engineer.
   3. Standby service may be required by utility agency.
   4. Required Notice:
      a. Fire Department: 48 hours.
      b. Affected Customers: 48 hours.
      c. If local regulations require more notice, the local regulations shall prevail.
   5. Operation of Existing Valves: By Owner's employees only.

B. Contamination of Existing Lines:
   1. Prevent.
   2. Be responsible for all costs of chlorinating and flushing contaminated lines.

PART 2 - PRODUCTS

2.1 PIPE AND FITTING MATERIALS

A. Ductile Iron Pipe:
   1. ANSI/AWWA C150/A21.50 and C151/A21.51.
   2. Class: 52.
   3. Cement Mortar Lining:
      a. ANSI/AWWA C104/A21.4.
      b. Double thickness.
   4. Meet the requirements of ANSI/NSF Standard 61 and the certification must be stamped on the exterior wall of the pipe.
   5. Joints:
      a. ANSI/AWWA C111/A21.11.
      b. Push-on.
      c. Restrained:
         1) 6-Inch Through 24-Inch:
            a) U.S. Pipe: TR Flex Restrained Joint; Field Lok gasket.
            b) American: Flex-Ring Restrained Joint; Fast Grip gasket.
            c) Clow: Super-Lock Restrained Joint.
            d) Griffin Pipe: Snap-lok restrained joint.
            e) Mechanical joint restraint with Megalugs by Ebaa Iron Sales; or equal.
         2) For pipe sizes greater than 24-inch, joints requiring restraint shall be by manufactured restrained joint pipe.
      d. Lubricant: Provide in accordance with Manufacturer’s recommendation.

B. HDPE Pipe:
   1. Ductile Iron Pipe Size (DIPS), DR 11 (200 psi)
   2. Material Minimums:
      a. High density polyethylene pipe compound molecular weight of 0.941.
      b. Material Designation: PE 4710.
      c. Material Classification: Type III, Class C, Category 5, Grade P34; ASTM D1248.
      d. Cell Classification: ASTM D3350 445574C/E, PE 4710.
      e. Manufacturing Standard: ASTM D3350.

f. Pipe shall contain no recycled compounds except that generated in the Manufacturer's own plant from resin of the same specification from the same raw material.

3. Manufacturers: Poly Pipe, Inc., Performance Pipe, ISCO Industries; or equal.
4. Butt fused joints using equipment and methods in strict accordance with the pipe Manufacturer's recommendations and ASTM D3261 and ASTM D2657

C. Detection Wire:
1. Required for all HDPE Pipe
2. Copper wire, solid or braided, with coating to prevent oxidation and deterioration.
3. Minimum Gage: 12 AWG.
4. 2 wires to be placed slightly above the pipe.

D. Fittings:
1. All fittings shall be restrained to pipe.
2. Ductile Iron Fittings:
   a. 6-Inch Through 24-Inch:
      1) ANSI/AWWA C153/A21.53, compact fittings.
      2) Mechanical joints.
      3) 350 psi pressure rating.
      4) Lining:
         a) Standard thickness, cement mortar lining in accordance with AWWA C104.
         b) Fusion bonded epoxy in accordance with AWWA C550, nominal 6-8 Mils.
   b. Joint Restraint for Ductile Iron Fittings to Ductile Iron Pipe:
      1) 6-Inch Through 24-Inch Pipe:
         a) Mechanical joints with Megalugs by Ebaa Iron Sales; or equal.
         b) Push-on joint with stainless steel gripper gasket.
         c) Restrained joints, as indicated on Drawings, to match restrained joint pipe.
      2) 30-Inch Through 48-Inch Pipe: Restrained joints.
3. HDPE Fittings:
   a. ASTM D3261, F2206, and ANSI/AWWA C906.
   b. Molded or fabricated from polyethylene compound having a cell classification equal to or exceeding the cell classification of the pipe.
   c. Molded Fittings: Pressure rated to match the pipe SDR pressure rating to which they are connected.
   d. Fabricated Fittings:
      1) Made from pipe with a pressure rating at least 25% greater than the pipe to which they are connected.
      2) Angle of bends to have tolerance of ± 1% of required angle.
      3) Field fabricated elbows are not permissible
   e. Pipe Joining:
      1) Pipe to Fitting Joining: Butt fused using equipment and methods in strict accordance with the pipe Manufacturer's recommendations.
      2) Joining Segments of Fabricated Fittings: Butt fused using equipment and methods in strict accordance with the pipe Manufacturer's recommendations.
   f. Transitions from HDPE Pipe to Other Materials:
      1) AWWA C906.
      2) Flanged joint adapter.
      3) Obtain Engineer's review.
      4) Manufacturers: Phillips Driscopipe, Inc.; Chevron Chemical Company; Plexco; or equal.

E. Gaskets:
1. ANSI/AWWA C111/A21.11.
2. Styrene Butadiene (SBR).
3. Nitrile (NBR).

2.2 MANUFACTURED UNITS

A. Valves:
1. Manufacturer: EJIW, Clow, US Pipe.
2. Resilient-Seated Gate Valve: AWWA C515:
   a. Nonrising stem.
   b. Wrench nut, 2-inch square.

c. Open left (counter clockwise).
d. Mechanical joint ends.
e. Stem Seal: Buna-N double O-rings.
f. Body and Bonnet: Ductile iron.
g. Wedge: ASTM D429 rubber coated cast or ductile iron.
h. Coating: AWWA C550 fusion-bonded epoxy.
i. Pressure Rating: 200 psi.
j. Stem: Manganese bronze.

3. Valve Boxes:
   a. Manufacturers and Models:
      1) East Jordan Iron Works 8560 with No. 6 base.
      2) Tyler Pipe, 6860 series with #6 base.
      3) Mueller 10357 with No. 160 base.
   b. 5-1/4-inch shaft.
   c. Three section cast iron.
   d. Cast iron lid marked "WATER".
   e. Adjustable:
      1) By means of threaded top and center sections.
      2) Height: 51 inches to 72 inches.

B. Manholes, Vaults and Chambers:
1. General:
   a. Grade Rings: ASTM C478.
   b. Joints:
      1) 1-inch butyl gasket in flexible rope form.
      2) E.Z. Stik, Butyl-Lok; or equal.
   c. Steps:
      1) Manufacturers: MA Industries, PS-1-PF; or equal.
      2) Steel rod, 1/2-inch, encapsulated in copolymer polypropylene.
   d. Casting:
      1) Manufacturers and Models: Neenah, R-1670; East Jordan Iron Works, 1045.
      2) Solid, gasketed, self-sealing cover.
      3) Imprinted on Cover: "WATER".
   e. Connection Between Manhole and Sewer:
      1) Resilient Connector: ASTM C923 and ASTM A167.
      2) 304 stainless steel bands.
      3) KOR-N-SEAL by NPS, Inc.; or equal.
2. Valve Manholes and Air Release Chambers:
   a. Precast Sections: ASTM C478.
   b. Corporation Stops: Mueller, H-15000; Hays Co., 5200.
3. Valve Vaults:
   a. Precast Sections: C 478.
   b. Waterproofing Bituminous: ASTM D449.

PART 3 - EXECUTION

3.1 EARTHWORK

A. In accordance with Division 31 Section “Excavation and Fill for Utilities.”

3.2 LINE AND GRADE

A. Lay pipe to the grades and elevations indicated on the Drawings.

B. Where No Grades are Indicated:
1. Lay pipe with a minimum of 6-1/2 feet of cover below finish grade.
2. Lay pipe at constant uphill and downhill grades to and from air release valves.
3. Avoid high points except at air release valves.

3.3 INSTALLATION

A. General:
1. Except as herein provided or indicated on the Drawings, install in accordance with:
   a. DI: AWWA C600.
   b. HDPE: AWWA M55.
2. Protect all materials before, during and after installation.
3. Install pipe, fittings and appurtenances in accordance with Manufacturer's recommendations except as indicated herein or on the Drawings.
4. Prevent entrance of foreign materials.
5. Restrain pipe, fittings, valves and couplings as required.

B. Placement of Pipe:
1. Bearing: Support entire length of pipe barrel evenly with extra excavation at joints.
2. Bell and Spigot: Clean and lubricate immediately prior to assembly.
3. Jointing:
   a. Mechanical: Tighten evenly to 75 to 90-foot-pounds of torque.
   b. Restrained: Manufacturer's recommended method.
   c. Fusing: Manufacturer’s recommended method.
4. Cutting Pipe:
   a. Power saw.
   b. Ductile Iron and PVC Pipe: Taper cut end by grinding or filing back at least 1/8-inch on a 30 degree bevel.
   c. HDPE: AWWA M55.
5. Thoroughly clean gasket seating surfaces in the socket and on the plain end of the pipe to remove all coating rust and foreign material before use of conductive gasket.

C. Setting Valves and Valve Boxes:
1. Set plumb on 4 inches of compacted 3/8-inch (minimum) crushed stone.
2. Valve Boxes:
   a. Shall not transmit shock to valve.
   b. Plumb over operating nut.
   c. Set cover to finished grade.
   d. Witness.
3. Pressure Tap Sleeve and Valve:
   a. Set at the direction of tapping Subcontractor.
   b. Set and remove tapping machine.

D. Hydrants: Place “Out of Service” placards or labeled bags on pumper nozzle of all hydrants immediately after installation and on all disconnected existing hydrants. Remove after water main is placed in service.

E. Thrust Control:
1. Provide at all fittings.
2. Installation in Accordance With:
   a. Shop Drawings reviewed by Engineer.
   b. Manufacturer's instructions.
3. Restrain all pipe joints within given distance from each fitting (both directions):

Table 1
Length of Restrained Pipe Required

Pipe Diameter	22-1/2 Degree Bends and Less	45 Degree Bends	90 Degrees Bends, Plugs	Tee Run	Tee Branch
6-inch	5-foot	10-foot	20-foot	10-foot	10-foot
8-inch	5-foot	10-foot	25-foot	10-foot	20-foot
10-inch	5-foot	15-foot	35-foot	10-foot	25-foot
12-inch	10-foot	15-foot	40-foot	10-foot	30-foot
16-inch	10-foot	20-foot	50-foot	10-foot	40-foot

F. Placement of Tracer Wire or Pipe Identification Tape:
1. Bury 12 inches above water main.
2. Solder and wrap wire splices.

3. Splice pipe identification tape to ensure continuity of metal foil.
4. Bring wire or tape to surface in valve boxes or as directed by Engineer.

3.4 TESTING AND DISINFECTION

A. Observation: By Engineer.

B. Notification:
1. Pressure Testing: Arrange with Engineer following successful pretesting.
2. Bacteriological Testing: Arrange with Engineer/Owner following successful pressure test.

C. Equipment and Manpower: Provide everything required for testing, disinfection and flushing.

D. Water:
1. To be provided by Owner.
2. Provide temporary connections from Municipal water system to the water main or for hauling water.
3. Provide backflow prevention device.

E. Pressure and Leak Tests for DI and HDPE Pipe:
1. ANSI/AWWA C600.
2. Duration: 2 hours.
3. Pressure:
   a. Maintain 180 pounds per square inch at the average elevation in water main segment being tested.
   b. Do not exceed the pipe's rated test pressure.
4. Water:
   a. To be provided by Owner.
   b. Contractor shall be responsible for providing temporary connections and backflow preventor from Municipal water system for hauling water.
5. Make-Up Water: From measurable source.
6. Maximum Allowable Leakage:

$$L = \frac{SxDxP^{0.5}}{148{,}000} + 0.0078 \text{ gal/hr/in of diameter for each closed valve tested against}$$

L = Leakage in gallons per hour.
S = Length of pipe tested in feet; maximum value 2,000. When length of pipe tested exceeds 2,000 feet, the allowable leakage will be based on 2,000 feet.
D = Pipe diameter in inches.
P = Test pressure: 150 pounds per square inch.

7. Maximum Length of Pipe to be Tested: 2,000 feet, or nearest 2 valves if water on opposite side of valve is not in service.
8. Perform test against tapped cap or plug with a standpipe and not against existing valve if water on opposite side of valve is in service.
9. Repair leaks and repeat tests until acceptable results are achieved.
10. Pressure testing against existing valves not allowed.

F. Disinfection:
1. In Accordance with AWWA C651:
   a. Sodium hypochlorite.
   b. Continuous-feed method.
   c. Calcium hypochlorite granules not required.
   d. Minimum residual 25 parts per million (ppm) initial concentration.
   e. Minimum residual 10 ppm after 24 hours.

G. Flushing:
1. Water main Mainlines: In accordance with AWWA C651.
2. Water Services Into Buildings: In accordance with NFPA 24.
3. Water: Owner supplied.

4. Provide backflow preventor.
5. Velocity:
   a. Water main Mainline: Minimum 3 feet per second in accordance with AWWA.
   b. Water Services (Domestic and Fire Protection): Minimum 10 feet per second in accordance with NFPA.
6. Duration:
   a. Initial: Until entire volume of water in pipeline has been replaced.
   b. Final: Until residual chlorine equals that of adjoining system.
7. Dispose of chlorine residual in accordance with applicable state and local requirements.
8. Disposal location to be inspected by Engineer. If there is any questions that the discharge will harm the environment, apply a reducing agent to the water to neutralize the chlorine to a 1 ppm residual.

H. Bacteriological Testing:
1. In accordance with AWWA C651 and state regulatory agency requirements.
2. Two consecutive bacteriologically safe samples must be taken at 24-hour intervals for each section of pipe tested.
3. Repeat disinfection if bacteriological test fails.
4. Collect Samples from each branch of pipe, and at a maximum spacing of 1,000 feet.
5. Engineer: Transport Samples to lab for testing.
6. Cost of initial and repeat bacteriological lab tests are the responsibility of Contractor.

I. Sequence:
1. Pressure test.
2. Flush.
3. Chlorinate.
4. Flush.
5. Wait 24 hours.
6. Bacteriological sample.
7. Wait 24 hours.
8. Bacteriological sample.
9. Place in service.

END OF SECTION 33 10 00

SECTION 00 11 13 - ADVERTISEMENT FOR BIDS

City of Grand Ledge

Well 2 Raw Water Main

1. RECEIPT OF BIDS

City of Grand Ledge, the Owner, will receive sealed Bids for construction of the Well 2 Raw Water Main project at the Grand Ledge City Hall, 310 Greenwood Street, Grand Ledge, Michigan 48837 until June 15, 2023 at 10 a.m. , local time. No Bids will be received after that time. Bids will be publicly opened and read aloud at that time and place.

2. SCOPE OF PROJECT

The Work covered by the Contract Documents comprises construction of a raw water main from Well 2, located at 425 East River Street to the City of Grand Ledge Water Treatment Plant at 320 East Saginaw Highway, Grand Ledge, MI 48837. The Work includes the following major items:

- Approximately 5,700 feet of 8-inch HDPE Raw Water Main to be installed utilizing both Horizontal directional drilling and open cut techniques including testing and appurtenances.
- Connection to the existing Well 2 discharge line.
- Connection to the existing water treatment plant raw water system.
- Furnish and install VFD at Well 2.
- Restoration of disturbed areas including bituminous paving, concrete surfacing, and lawn restoration.
- Temporary maintenance of traffic during construction.

3. FINANCING

The Project will be financed with funds provided by the Michigan Department of Environment, Great Lakes, and Energy's Drinking Water State Revolving Fund, and the Contract Documents reflect requirements by that agency.

4. ISSUING OFFICE

Bidding Documents are being issued from Fishbeck's Grand Rapids office. Bidders should direct questions and correspondence to that office.

5. EXAMINATION OF DOCUMENTS

Bidding Documents may be examined at the following locations after May 15, 2023 at 2 p.m., local time.

Fishbeck, 1515 Arboretum Drive, SE, Grand Rapids, Michigan 49546, 616.575.3824.

City of Grand Ledge, 310 Greenwood Street, Grand Ledge, Michigan 48837, 517.627.2194.

Builder's Exchanges: Grand Rapids and Lansing, Michigan.

Dodge Data & Analytics: Hot Springs, AR (formerly known as McGraw-Hill Dodge, Dodge Reports).

A list of entities to whom the Bidding Documents have been issued will be available online at www.fishbeck.com. Click on "Bid Sets/Bidders Lists."

6. OBTAIN BIDDING DOCUMENTS

Bidding Documents may be obtained (ordered) online, go to www.fishbeck.com, click on "Bid Sets/Bidders Lists." Costs for electronic downloads is $1.25 per file, plus tax. Cost for printed sets of Bidding Documents is $60.00 plus tax and shipping. Individuals/companies that electronically download full sets or purchase printed sets are automatically added to the list of plan holders. Obtaining Bidding Documents from any source not identified herein may result in failure to receive addenda, corrections, or other revisions that may be issued.

7. BID SECURITY

Bid security in the amount, form and subject to the conditions provided in the Instructions to Bidders must be submitted with each Bid.

8. WITHDRAWAL OF BIDS

Bids may not be withdrawn for a period of 120 days after the actual date of opening thereof. This time period may be extended by mutual agreement of the Owner and any Bidder or Bidders.

9. RIGHT TO REJECT BIDS

The Owner reserves the right to waive any irregularities and to reject any and all Bids.

10. PREBID CONFERENCE

A prebid conference will be held on May 25, 2023 at 10 a.m. local time at 310 Greenwood Street, Grand Ledge, Michigan 48837. Prospective Bidders are encouraged to attend and participate in the conference, but attendance is not mandatory.

11. ON-SITE LABOR

Owner financing agency requires that all on-site construction labor be paid prevailing wages.

END OF SECTION 00 11 13

SECTION 00 21 13 - INSTRUCTIONS TO BIDDERS

ARTICLE 1 - DEFINED TERMS

1.01 Terms used in these Instructions to Bidders will have the meanings indicated in the General Conditions (Standard General Conditions of the Construction Contract, EJCDC, No. C-200, 2018 edition) and the Supplementary Conditions. Additional terms used in these Instructions to Bidders have the meanings indicated below which are applicable to both the singular and plural thereof:

A. Issuing office – the office identified in the Advertisement for Bids, from which the Bidding Documents are to be issued and where the bidding procedures are to be administered.

ARTICLE 2 - COPIES OF BIDDING DOCUMENTS

2.01 Complete sets of the Bidding Documents in the number and for the cost stated in the Advertisement for Bids may be obtained as indicated in the Advertisement for Bids.

2.02 Complete sets of Bidding Documents must be used in preparing Bids; neither Owner nor Engineer assumes any responsibility for errors or misinterpretation resulting from the use of incomplete sets of Bidding Documents.

2.03 Owner and Engineer, in making copies of Bidding Documents available on the above terms, do so only for the purpose of obtaining Bids on the Work and do not authorize or confer a license or grant for any other use.

ARTICLE 3 - QUALIFICATIONS OF BIDDERS

3.01 Each Bid shall contain evidence of Bidder's qualification to do business in the state where the Project is located or Bidder must covenant to obtain such qualification prior to award of the Contract.

3.02 Bidder is advised to carefully review those portions of the Bid Form requiring Bidder’s representations and certifications.

3.03 To demonstrate Bidder’s qualifications to perform the Work, within 5 days of Owner's request Bidder shall submit written evidence of:

A. Financial data, previous experience, present commitments, workers' compensation experience modification rating (EMR) and other such data as may be requested by Owner.

B. Previous experience in constructing at least 3 projects of a similar type, comparable size and comparable complexity within the past 5 years.

3.04 When so requested, Bidder shall meet with Owner's representatives and give further information in order to determine Bidder's qualifications, responsibility, ability to perform and complete the Work in accordance with the Contract Documents.

3.05 Owner reserves the right to reject any Bid if the evidence submitted by, or investigation of, a Bidder fails to satisfy Owner that the Bidder is properly qualified to carry out the obligations of the Contract and to complete the work contemplated therein.

ARTICLE 4 - EXAMINATION OF BIDDING DOCUMENTS, OTHER RELATED DATA, AND SITE

4.01 Subsurface and Physical Conditions

A. The supplementary Conditions identify:

1. Those reports known to Owner of explorations and tests of subsurface conditions at or contiguous to the Site.

2. Those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities).

B. Copies of reports and drawings referenced in Paragraph 4.01.A will be made available by Owner to any Bidder on request at the cost of preparation, reproduction and shipping. Those reports and drawings are not part of the Contract Documents, but the "technical data" contained therein upon which Bidder is entitled to rely as provided in Paragraph 5.03 of the General Conditions has been identified and established in Paragraph 5.03 of the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any "technical data" or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.

4.02 Underground Facilities

A. Information and data indicated in the Bidding Documents with respect to existing Underground Facilities at or contiguous to the Site are based upon information and data furnished to Owner and Engineer by owners of such Underground Facilities, including Owner, or others.

4.03 Hazardous Environmental Condition

A. The Supplementary Conditions identify any reports and drawings known to Owner relating to a Hazardous Environmental Condition identified at the Site.

B. Copies of reports and drawings referenced in Paragraph 4.03 A. will be made available by Owner to any Bidder on request at the cost of preparation, reproduction and shipping. Those reports and drawings are not part of the Contract Documents, but the "technical data" contained therein upon which Bidder is entitled to rely as provided in Paragraph 5.06 of the General Conditions has been identified and established in Paragraph 5.06 of the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any "technical data" or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.

4.04 Provisions concerning responsibilities for the adequacy of data, if any, furnished to prospective Bidders with respect to subsurface conditions, other physical conditions and Underground Facilities, and possible changes in the Bidding Documents due to differing or unanticipated subsurface or physical conditions appear in Paragraphs 5.03, 5.04, and 5.05 of the General Conditions. Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to a Hazardous Environmental Condition at the Site, if any, and possible changes in the Contract Documents due to any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work appear in Paragraph 5.06 of the General Conditions.

4.05 On request, Owner will provide Bidder access to the Site to conduct such examinations, investigations, explorations, tests and studies as Bidder deems necessary for submission of a Bid. Bidder shall fill all holes, clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests and studies. Bidder shall comply with all applicable Laws and Regulations relative to excavation and utility locates.

4.06 Reference is made to the Supplementary Conditions and Division 01 Section "Summary of Work," for the identification of the general nature of other work that is to be performed at the Site by Owner or others (such as utilities and other prime contractors) that relates to the Work contemplated by these Bidding Documents. On request, Owner will provide to each Bidder for examination access to or copies of contract documents, if any, (other than portions thereof related to price) for such other work.

4.07 Paragraph 7.13 C. of the General Conditions indicates that if an Owner safety program exists, it will be noted in the Supplementary Conditions.

4.08 It is the responsibility of each Bidder before submitting a Bid to:

A. examine and carefully study the Bidding Documents, and the other related data identified in the Bidding Documents;

B. visit the Site and become familiar with and satisfy Bidder as to the general, local and Site conditions that may affect cost, progress, and performance of the Work;

C. become familiar with and satisfy Bidder as to all federal, state and local Laws and Regulations that may affect cost, progress, or performance of the Work;

D. carefully study all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities) that have been identified in Paragraph 5.03 of the Supplementary Conditions as containing reliable "technical data," and (2) reports and drawings of Hazardous Environmental Conditions, if any, at the Site that have been identified in Paragraph 4.06 of the Supplementary Conditions as containing reliable "technical data;"

E. consider the information known to Bidder; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents; and (3) Bidder's safety precautions and programs;

F. agree at the time of submitting its Bid that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of its Bid for performance of the Work at the price(s) bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents;

G. become aware of the general nature of the work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents;

H. promptly give Engineer written notice of all conflicts, errors, ambiguities or discrepancies that Bidder discovers in the Bidding Documents and confirm that the written resolution thereof by Engineer is acceptable to Bidder; and

I. determine that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work.

4.09 The submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article 4, that without exception the Bid is premised upon performing and furnishing the Work required by the Bidding Documents and applying any specific means, methods, techniques, sequences and procedures of construction that may be shown or indicated or expressly required by the Bidding Documents, that Bidder has given Engineer written notice of all conflicts, errors, ambiguities and discrepancies that Bidder has discovered in the Bidding Documents and the written resolutions thereof by Engineer are acceptable to Bidder, and that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the Work.

ARTICLE 5 - PREBID CONFERENCE

5.01 A Prebid Conference will be held on Thursday, May 25, 2023, at 10 a.m., local time at 310 Greenwood Street, Grand Ledge, Michigan 48837. Representatives of Owner and Engineer will be present to discuss the Project. Bidders are encouraged to attend and participate in the conference. Engineer will transmit to all prospective Bidders of record such Addenda as Engineer considers necessary in response to questions arising at the conference. Oral statements may not be relied upon and will not be binding or legally effective.

ARTICLE 6 - SITE AND OTHER AREAS

6.01 The Site is identified in the Bidding Documents. Easements for permanent structures or permanent changes in existing facilities are to be obtained and paid for by Owner unless otherwise provided in the Bidding Documents. All additional lands and access thereto required for temporary construction facilities, construction equipment or storage of materials and equipment to be incorporated in the Work are to be obtained and paid for by Contractor.

ARTICLE 7 - INTERPRETATIONS AND ADDENDA

7.01 All questions about the meaning or intent of the Bidding Documents are to be directed to Engineer in writing. Interpretations or clarification considered necessary by Engineer in response to such questions will be issued by Addenda mailed or delivered to all parties recorded by Engineer as having received the Bidding Documents. Questions received less than 6 days prior to the date for opening of Bids may not be answered. Only questions answered by Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.

7.02 Addenda may be issued to clarify, correct, or change the Bidding Documents as deemed advisable by Owner or Engineer.

ARTICLE 8 - BID SECURITY

8.01 A Bid must be accompanied by an original Bid security (with affixed seal) made payable to Owner in an amount of 5% of Bidder's maximum Bid price and in the form of a certified check, bank money order, or a Bid bond (optional form attached) issued by a surety meeting the requirements of paragraphs 6.01 and 6.02 of the General Conditions. Facsimile, telegraphic, or other electronically transmitted Bid Security or Bid bonds submitted with the Bid will be considered provided that, within 48 hours after the time for receipt of Bids, the original Bid bond form with the original signature and original required attachments are received by Engineer. Attorneys-in-fact who execute the Bid Security or Bid bond on behalf of the Surety shall affix to the bond a certified and current copy of the power of attorney.

8.02 The Bid security of the Successful Bidder will be retained until such Bidder has executed the Contract Documents, furnished the required contract security and met the other conditions of the Notice of Award, whereupon the Bid security will be returned. If the Successful Bidder fails to execute and deliver the Contract Documents and furnish the required contract security within 15 days after the Notice of Award, Owner may consider Bidder to be in default, annul the Notice of Award, and the Bid security of that Bidder will be forfeited. Such forfeiture shall be Owner's exclusive remedy if Bidder defaults. The Bid security of other Bidders whom Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of 7 days after the Effective Date of the Agreement or 121 days after the Bid opening, whereupon Bid security furnished by such Bidders will be returned.

8.03 Bid security of other Bidders whom Owner believes do not have a reasonable chance of receiving the award will be returned within 7 days after the Bid opening.

ARTICLE 9 - CONTRACT TIMES

9.01 The dates by which the Work is to be substantially completed and ready for final payment are set forth in the Agreement.

ARTICLE 10 - LIQUIDATED DAMAGES

10.01 Provisions for liquidated damages, if any, are set forth in the Agreement.

ARTICLE 11 - SUBSTITUTE AND "OR EQUAL" ITEMS

11.01 The Contract, if awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents without consideration of possible substitute or "or equal" items.

11.02 Whenever materials or equipment are specified or described in the Bidding Documents by using the name of one or more Suppliers, the Bid shall be based on providing the materials or equipment of one of the Suppliers named.

11.03 Whenever it is specified or described in the Bidding Documents that a substitute or "or equal" item of material or equipment may be furnished or used by Contractor if acceptable to Engineer, application for such acceptance will not be considered by Engineer until after the Effective Date of the Agreement. The procedure for submission of any such application by Contractor and consideration by Engineer is set forth in Paragraph 6.05 of the General Conditions and may be supplemented in Division 01 - General Requirements.

ARTICLE 12 - SUBCONTRACTORS, SUPPLIERS AND OTHERS

12.01 If the Supplementary Conditions require, or if Owner requests, the identity of certain Subcontractors, Suppliers, individuals, or entities to be submitted to Owner in advance of a specified date prior to the Effective Date of the Agreement, the apparent Successful Bidder, and any other Bidder so requested, shall within 5 days after Bid opening, submit to Owner a list of all such Subcontractors, Suppliers, individuals, or entities proposed for those portions of the Work for which such identification is required. Such list shall be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualifications for each such Subcontractor, Supplier, individual or entity if requested by Owner. If Owner or Engineer, after due investigation, has reasonable objection to any proposed Subcontractor, Supplier, individual, or entity, Owner may, before the Notice of Award is given, request apparent Successful Bidder to submit an acceptable substitute, in which case the apparent Successful Bidder shall submit an acceptable substitute, Bidder's Bid price will be increased (or decreased) by the difference in cost occasioned by such substitution, and Owner may consider such price adjustment in evaluating Bids and making the Contract award.

12.02 If apparent Successful Bidder declines to make any such substitution, Owner may award the Contract to the next lowest Bidder that proposes to use acceptable Subcontractors, Suppliers, individuals, or entities. Declining to make requested substitutions will not constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor, Supplier, individual, or entity so listed and against which Owner or Engineer makes no written objection prior to the giving of the Notice of Award will be deemed acceptable to Owner and Engineer subject to revocation of such acceptance after the Effective Date of the Agreement as provided in Paragraph 7.07 of the General Conditions.

12.03 Contractor shall not be required to employ any Subcontractor, Supplier, individual, or entity against whom Contractor has reasonable objection.

ARTICLE 13 - PREPARATION OF BID

13.01 The Bid form is included with the Bidding Documents. Additional copies may be obtained from Engineer or are available online.

13.02 All blanks on the Bid form shall be completed by printing in ink or by typewriter and the Bid signed in ink. Erasures or alterations shall be initialed in ink by the person signing the Bid form. A Bid price shall be indicated for each Bid item, alternative, adjustment unit price item listed therein. In the case of optional alternatives the words “No Bid”, “No Change”, or “Not Applicable” may be entered.

13.03 A Bid by a corporation shall be executed in the corporate name by the president, vice president, or other corporate officer accompanied by evidence of authority to sign. The corporate seal shall be affixed, if required by state law, and attested by the secretary or an assistant secretary. The corporate address and state of incorporation shall be indicated below the signature.

13.04 A Bid by a partnership shall be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The official address of the partnership shall be indicated below the signature.

13.05 A Bid by a limited liability company shall be executed in the name of the firm by a member and accompanied by evidence of authority to sign. The state of formation of the firm and the official address of the firm shall be indicated below the signature.

13.06 A Bid by an individual shall indicate the Bidder's name and official address.

13.07 A Bid by a joint venture shall be executed by each joint venturer in the manner indicated on the Bid form. The official address of the joint venture shall be indicated below the signature.

13.08 All names shall be typed or printed in ink below the signatures.

13.09 The Bid shall contain an acknowledgment of receipt of all Addenda, the numbers of which shall be filled in on the Bid form.

13.10 Postal and e-mail addresses and telephone number for communications regarding the Bid shall be indicated.

13.11 The Bid shall contain evidence of Bidder's authority and qualification to do business in the state where the Project is located or Bidder shall covenant in writing to obtain such authority and qualification prior to award of the Contract and attach such covenant to the Bid. Bidder's state contractor license number, if any, for the state in which the Project is located shall also be indicated on the Bid form.

ARTICLE 14 - BASIS OF BID; COMPARISON OF BIDS

14.01 Basis of Bid

A. Bidders shall submit a Bid on a unit price basis for each item of Work listed in the Bid schedule.

B. The total of all estimated prices will be determined as the sum of the products of the estimated quantity of each item and the unit price Bid for the item. The final quantities and Contract Price will be determined in accordance with Paragraph 11.03 of the General Conditions.

14.02 The Bid price shall include such amounts as the Bidder deems proper for Contractor's overhead, costs, profit and other expenses on account of cash allowances, if any, named in the Contract Documents, in accordance with Paragraph 13.02 B. of the General Conditions.

14.03 Discrepancies between the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum. Discrepancies between words and figures will be resolved in favor of the words.

ARTICLE 15 - SUBMITTAL OF BID

15.01 Blank copies of the Bid form and the Bid and Contract bond form are included in the Bidding Documents are available online. (Go to www.fishbeck.com, click on "Bid Sets/Bidders Lists") The Bid form and the Bid and Contract Bond form are to be completed and submitted and shall be accompanied by other required documents.

15.02 A Bid shall be submitted no later than the date and time prescribed and at the place indicated in the Advertisement for Bids and shall be enclosed in an opaque, sealed package, plainly marked with the Project title and name and address of the Bidder and shall include the forms and documents specified in Paragraph 15.01. If a Bid is sent by mail or other delivery system, the sealed envelope containing the Bid shall be enclosed in a separate package plainly marked on the outside with the notation "BID ENCLOSED".

15.03 Bid forms with facsimile or other electronically transmitted signatures will not be considered.

ARTICLE 16 - MODIFICATION AND WITHDRAWAL OF BIDS

16.01 A Bid may be modified or withdrawn by an appropriate document duly executed in the manner that a Bid must be executed and delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bids.

16.02 If, within 24 hours after Bids are opened, any Bidder files a duly signed, written notice with Owner and promptly thereafter demonstrates to the reasonable satisfaction of Owner that there was a material and substantial mistake in the preparation of its Bid, that Bidder may withdraw its Bid and the Bid security will be returned. Thereafter, if the Work is rebid, that Bidder will be disqualified from further bidding on the Work.

16.03 No withdrawal of a Bid shall be permitted on account of mistake or any other reason after the expiration of this 24 hour period.

ARTICLE 17 - OPENING OF BIDS

17.01 Bids will be opened at the time and place indicated in the Advertisement for Bids and, unless obviously nonresponsive, read aloud publicly. An abstract of the amounts of the Bids and major alternates, if any, will be made available to Bidders after the opening of Bids.

ARTICLE 18 - BIDS TO REMAIN SUBJECT TO ACCEPTANCE

18.01 All Bids will remain subject to acceptance for the period of time stated in the Bid form, but Owner may, in its sole discretion, release any Bid and return the Bid security prior to the end of this period.

ARTICLE 19 - AWARD OF CONTRACT

19.01 Owner reserves the right to reject any or all Bids, including without limitation, nonconforming, nonresponsive, unbalanced or conditional Bids. Owner further reserves the right to reject the Bid of any Bidder whom it finds, after reasonable inquiry and evaluation, to not be responsible. Owner may also reject the Bid of any Bidder if Owner believes that it would not be in the best interest of the Project to make an award to that Bidder. Owner also reserves the right to waive all informalities not involving price, time or changes in the Work and to negotiate contract terms with the Successful Bidder.

19.02 More than one Bid for the same Work from an individual or entity under the same or different names will not be considered. Reasonable grounds for believing that any Bidder has an interest in more than one Bid for the Work may be cause for disqualification of that Bidder and the rejection of all Bids in which that Bidder has an interest.

19.03 In evaluating Bids, Owner will consider whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices, and other data as may be requested in the Bid form or prior to the Notice of Award.

19.04 In evaluating Bidders, Owner will consider the qualifications of Bidders and may consider the qualifications and experience of Subcontractors, Suppliers and other individuals or entities proposed for those portions of the Work for which the identity of Subcontractors, Suppliers, and other individuals or entities must be submitted as provided in the Supplementary Conditions.

19.05 Owner also may consider the operating costs, maintenance considerations, performance data and guarantees of materials and equipment proposed for incorporation in the Work when such data is required to be submitted prior to the Notice of Award.

19.06 Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications and financial ability of Bidders, proposed Subcontractors, Suppliers, individuals or entities proposed for those portions of the Work in accordance with the Contract Documents.

19.07 If the Contract is to be awarded, Owner will award the Contract to the Bidder whose Bid is in the best interests of the Project.

19.08 If the Contract is to be awarded, Owner will give Successful Bidder a Notice of Award within 90 days after the day of the Bid opening.

19.09 Award and execution of a contract is contingent on SRF funds being available, and the Project Milestone Schedule set by EGLE. Execution of the contract is contingent on SRF loan closing. The anticipated loan closing date is August 28, 2023, but subject to change as determined by the funding agency.

ARTICLE 20 - CONTRACT SECURITY AND INSURANCE

20.01 Article 6 of the General Conditions, as may be modified by the Supplementary Conditions, sets forth Owner's requirements as to insurance. When the Successful Bidder delivers the executed Agreement to Owner, it shall be accompanied by the required certificates of insurance (and other evidence of insurance requested by Owner).

20.02 Article 6 of the General Conditions, as may be modified by the Supplementary Conditions, sets forth Owner's requirements as to bonds. When Successful Bidder delivers the executed Agreement to Owner, it shall be accompanied by the required bonds.

ARTICLE 21 - SIGNING OF AGREEMENT

21.01 When Owner issues a Notice of Award to the Successful Bidder, it will be accompanied by the required number of unsigned counterparts of the Agreement bound into the Project Manual with the other Contract Documents which are identified in the Agreement as attached thereto. Within 30 days thereafter, Successful Bidder shall sign and deliver the required number of counterparts of the Agreement and attached documents to Owner. Within 20 days thereafter, Owner will deliver one fully signed counterpart to Successful Bidder.

ARTICLE 22 - RETAINAGE AND PROGRESS PAYMENTS

22.01 Provisions concerning retainage and progress payments are set forth in the Agreement.

22.02 Retainages and progress payments will be in accordance with State of Michigan Act 524 of the Public Acts of 1980.

END OF SECTION 00 21 13

SECTION 00 21 14 – STANDARD CONTRACT REQUIREMENT: DRINKING WATER STATE REVOLVING FUND

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Davis-Bacon/prevailing federal wages rates.
   1. Davis-Bacon Wage Decision for Eaton County, Michigan:
      a. The wage rates provided are for information only.
      b. The Wage Decision that will apply are those which are published at https://sam.gov/content/wage-determinations 10 days prior to Bid opening.
   2. The "Contracting Agency" or "Contracting Officer" for Davis-Bacon Wage Decision posters on jobsites is the Owner.
   3. Questions regarding prevailing wage and labor standards provisions should be directed to the Department of Labor.
   4. See additional Attachment to this Section.

B. Debarment Certification:
   1. The prime Contractor must provide a completed Certification Regarding Debarment Suspension, and Other Responsibility Matters Form with its Bid or proposal package to the Owner. See Section 00 41 43 Bid – Unit Price.

C. American Iron and Steel (AIS) provisions.
   1. The Contractor acknowledges the following American Iron and Steel Contract Language.

American Iron and Steel Contract Language

The Contractor acknowledges to and for the benefit of the City of Grand Ledge ("Purchaser") and the Michigan Department of Environment, Great Lakes, and Energy (the "State") that it understands the goods and services under this Agreement are being funded with monies made available by the Clean Water State Revolving Fund and/or the Drinking Water State Revolving Fund and such laws contain provisions commonly known as "American Iron and Steel (AIS);" that requires all iron and steel products used in the project be produced in the United States ("AIS Requirements") including iron and steel provided by the Contractor pursuant to this Agreement. The Contractor hereby represents and warrants to and for the benefit of the Purchaser and the State that (a) the Contractor has reviewed and understands the AIS Requirements, (b) all iron and steel used in the project will be and/or have been produced in the United States in a manner that complies with the AIS Requirements, unless a waiver of the requirements is approved or the State made the determination in writing that the AIS Requirements do not apply to the project, and (c) the Contractor will provide any further verified information, certification, or assurance of compliance with this paragraph, or information necessary to support a waiver of the AIS requirements, as may be requested by the Purchaser.

Notwithstanding any other provision of this Agreement, any failure to comply with this paragraph by the Contractor shall permit the Purchaser or State to recover as damages against the Contractor any loss, expense, or cost (including without limitation attorney's fees) incurred by the Purchaser or State resulting from any such failure (including without limitation any impairment or loss of funding, whether in whole or in part, from the State or any damages owed to the State by the Purchaser). While the Contractor has no direct contractual privity with the State, as a lender to the Purchaser for the funding of its project, the Purchaser and the Contractor agree that the State is a third-party beneficiary and neither this paragraph (nor any other provision of this Agreement necessary to give this paragraph force or effect) shall be amended or waived without the prior written consent of the State.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION 00 21 14

Davis-Bacon and Related Acts/Prevailing Federal Wages

P.L. 111-88 requires compliance with the Davis Bacon Act and adherence to the current U.S. Department of Labor Wage Decision. Attention is called to the fact that not less than the minimum salaries and wages as set forth in the Contract Documents (see Wage Decision included herein) must be paid on this project. The Wage Decision, including modifications, must be posted by the Contractor on the job site. The “Contracting Agency” or “Contracting Officer” for Davis-Bacon Wage Decision posters on jobsites is the loan applicant/bond issuer. A copy of the Labor Standards Provisions for Federally Assisted Projects is included and is hereby a part of this contract.

"General Decision Number: MI20230056 02/17/2023

Superseded General Decision Number: MI20220056

State: Michigan

Construction Type: Heavy

County: Eaton County in Michigan.

Heavy, Includes Water, Sewer Lines and Excavation (Excludes Hazardous Waste Removal; Coal, Oil, Gas, Duct and other similar Pipeline Construction)

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	. Executive Order 14026 generally applies to the contract. . The contractor must pay all covered workers at least $16.20 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2023.
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	. Executive Order 13658 generally applies to the contract. . The contractor must pay all covered workers at least $12.15 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2023.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at http://www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/06/2023
1	02/03/2023
2	02/17/2023

CARP0525-007 06/01/2021

Townships of Bellevue, Kalamo, Vermontville & Walton

	Rates	Fringes
CARPENTER, Includes Form Work	$ 25.94	20.59

CARP1004-015 06/01/2021

Remainder of County

	Rates	Fringes
CARPENTER, Includes Form Work	$ 27.39	20.73

ELEC0445-009 06/01/2022

Townships of Bellevue, Brookfield, Kalamo, Sunfield, Vermontville & Walton

	Rates	Fringes
ELECTRICIAN	$ 35.40	23.29

ELEC0665-013 05/31/2021

Townships of Benton, Carmel, Chester, Delta, Eaton, Eaton Rapids, Hamlin, Oneida, Roxand and Windsor

	Rates	Fringes

ELECTRICIAN.....$ 37.50 24.04+5.5%

ENGI0325-009 09/01/2022

POWER EQUIPMENT OPERATORS: Underground Construction (Including Sewer)

	Rates	Fringes
POWER EQUIPMENT OPERATOR		
GROUP 1	$ 37.67	24.85
GROUP 2	$ 32.78	24.85
GROUP 3	$ 32.28	24.85
GROUP 4	$ 32.00	24.85

POWER EQUIPMENT OPERATOR CLASSIFICATIONS

GROUP 1: Backhoe/ Excavator, Boring Machine, Bulldozer, Crane, Grader/ Blade, Loader, Roller, Scraper, Trencher (over 8 ft. digging capacity)

GROUP 2: Trencher (8-ft digging capacity and smaller)

GROUP 3: Boom Truck (non-swinging, non- powered type boom)

GROUP 4: Broom/ Sweeper, Fork Truck, Tractor, Bobcat/ Skid Steer /Skid Loader

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ENGI0326-011 06/01/2021

EXCLUDES UNDERGROUND CONSTRUCTION

	Rates	Fringes
OPERATOR: Power Equipment		
Group 1	$ 44.13	24.85
Group 2	$ 40.83	24.85
Group 3	$ 38.18	24.85
Group 4	$ 36.47	24.85
Group 5	$ 36.47	24.85
Group 6	$ 30.61	24.85

FOOTNOTES:

Crane operator with main boom and jib 300' or longer: $1.50 per hour above the group 1 rate.
Crane operator with main boom and jib 400' or longer: $3.00

per hour above the group 1 rate.

PAID HOLIDAYS: New Year's Day, Memorial Day, Fourth of July, Labor Day, Thanksgiving Day and Christmas Day.

POWER EQUIPMENT OPERATOR CLASSIFICATIONS

GROUP 1: Crane operator with main boom and jib 400', 300', or 220' or longer.

GROUP 2: Crane operator with main boom and jib 140' or longer, tower crane, gantry crane, whirley derrick

GROUP 3: Backhoe/Excavator; Boring Machine; Bulldozer; Crane; Grader/Blade; Loader; Roller; Scraper; Tractor; Trencher

GROUP 4: Bobcat/Skid Loader; Broom/Sweeper; Fork Truck (over 20' lift)

GROUP 5: Boom truck (non-swinging)

GROUP 6: Fork Truck (20' lift and under for masonry work)

IRON0025-011 06/01/2022

	Rates	Fringes
IRONWORKER (REINFORCING)	$ 31.43	34.77
IRONWORKER (STRUCTURAL)	$ 34.50	38.44

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* LABO0334-014 09/01/2022

SCOPE OF WORK:
OPEN CUT CONSTRUCTION: Excavation of earth and sewer, utilities, and improvements, including underground piping/conduit (including inspection, cleaning, restoration, and relining)

	Rates	Fringes
LABORER		
(2) Mason Tender-Cement/Concrete	$ 23.53	13.15
(4) Grade Checker	$ 23.70	13.15
(5) Pipelayer	$ 23.84	13.15

LABO0499-023 06/01/2022

EXCLUDES OPEN CUT CONSTRUCTION

	Rates	Fringes
LABORER		
Grade Checker; Mason Tender - Cement/Concrete; Pipelayer	$ 27.93	12.95

PAIN0845-017 05/21/2014

	Rates	Fringes
PAINTER: Brush, Roller and Spray	$ 21.89	11.85

PLAS0016-027 04/01/2014

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER	$ 24.64	12.88

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* PLUM0333-020 06/01/2022

	Rates	Fringes
PLUMBER/PIPEFITTER	$ 42.29	23.94

TEAM0007-011 06/01/2020

	Rates	Fringes
TRUCK DRIVER		
Lowboy/Semi-Trailer Truck	$ 28.05	.50 + a+b
Tractor Haul Truck	$ 27.80	.50 + a+b

FOOTNOTE:
a. $470.70 per week.
b. $68.70 daily.

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* SUMI2010-054 11/09/2010

	Rates	Fringes
LABORER: Common or General	$ 17.75	6.40
LABORER: Landscape	$ 12.25 **	0.00
TRUCK DRIVER: Dump Truck	$ 18.00	6.43

TRUCK DRIVER: Off the Road
Truck.....$ 20.82 3.69

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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** Workers in this classification may be entitled to a higher minimum wage under Executive Order 14026 ($16.20) or 13658 ($12.15). Please see the Note at the top of the wage determination for more information.

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at https://www.dol.gov/agencies/whd/government-contracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of ""identifiers"" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage

determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour National Office because National Office has responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISIO"

§5.5 Contract provisions and related matters.

(a) The Agency head shall cause or require the contracting officer to insert in full in any contract in excess of $2,000 which is entered into for the actual construction, alteration and/or repair, including painting and decorating, of a public building or public work, or building or work financed in whole or in part from Federal funds or in accordance with guarantees of a Federal agency or financed from funds obtained by pledge of any contract of a Federal agency to make a loan, grant or annual contribution (except where a different meaning is expressly indicated),and which is subject to the labor standards provisions of any of the acts listed in Sec. 5.1, the following clauses (or any modifications thereof to meet the particular needs of the agency, *Provided,* That such modifications are first approved by the Department of Labor):

(1) Minimum wages. (i) All laborers and mechanics employed or working upon the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (a)(1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in Sec. 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph (a)(1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

(ii)(A) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination, and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(2) The classification is utilized in the area by the construction industry; and

(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(C) In the event the contractor, the laborers, or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-dayperiod that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs (a)(1)(ii) (B) or (C) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fid fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside, in a separate account, assets for the meeting of obligations under the plan or program.

(2) *Withholding.* The ***City of Grand Ledge*** shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), all or part of the wages required by the contract, the (Agency) may, after written notice to the contractor, sponsor, applicant, or owner, take such action

as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

(3) *Payrolls and basic records.* (i) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work (or under the United States Housing Act of 1937, or under the Housing Act of 1949, in the construction or development of the project). Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made, and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii)(A) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the (write in name of appropriate federal agency) if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant, sponsor, or owner, as the case may be, for transmission to the (write in name of agency). The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead, the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at dol.gov/agencies/whd/government-contracts/construction/forms or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the (write in name of appropriate federal agency) if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit them to the applicant, sponsor, or owner, as the case may be, for transmission to the (write in name of agency), the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the sponsoring government agency (or the applicant, sponsor, or owner).

(B) Each payroll submitted shall be accompanied by a “Statement of Compliance”, signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be provided under Sec. 5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under Sec. 5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

(2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the “Statement of Compliance" required by paragraph (a)(3)(ii)(B) of this section.

(D) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under paragraph (a)(3)(i) of this section available for inspection, copying, or transcription by authorized representatives of the Michigan Department of Environment, Great Lakes, and Energy or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the Federal agency may, after written notice to the contractor, sponsor, applicant, or owner, take such action as maybe necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

(4) *Apprentices and trainees*- (i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the jobsite in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates

(expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

(5) *Compliance with Copeland Act requirements.* The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

(6) *Subcontracts*. The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as the (write in the name of the Federal agency) may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

(7) *Contract termination: debarment*. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

(8) *Compliance with Davis-Bacon and Related Act requirements.* All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

(9) *Disputes concerning labor standards.* Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

(10) *Certification of eligibility.* (i) By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C.1001.

(b) Contract Work Hours and Safety Standards Act. The Agency Head shall cause or require the contracting officer to insert the following clauses set forth in paragraphs (b)(1), (2), (3), and (4) of this section in full in any contract in an amount in excess of $100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by Sec. 5.5(a) or 4.6 of part 4 of this title. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

(1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

(c) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (b)(1) of this section the contractor and any subcontractor responsible there for shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (b)(1) of this section, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (b)(1) of this section.

(3) Withholding for unpaid wages and liquidated damages. The ***City of Grand Ledge*** shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (b)(2) of this section.

(4) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (b)(1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (b)(1) through (4) of this section.

(5) In addition to the clauses contained in paragraph (b), in any contract subject only to the Contract Work Hours and Safety Standards Act and not to any of the other statutes cited in Sec.5.1, the Agency Head shall cause or require the contracting officer to insert a clause requiring that the contractor or subcontractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three years from the completion of the contract for all laborers and mechanics, including guards and watchmen, working on the contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. Further, the Agency Head shall cause or require the contracting officer to insert in any such contract a clause providing that the records to be maintained under this paragraph shall be made available by the contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the Michigan Department of Environment, Great Lakes, and Energy and the Department of Labor, and the contractor or subcontractor will permit such representatives to interview employees during working hours on the job.

SECTION 00 31 32 – GEOTECHNICAL DATA

Beginning of Geotechnical Data

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MATERIALS TESTING CONSULTANTS

GEOTECHNICAL REPORT

GRAND LEDGE WELL 2 RAW WATER MAIN CONSTRUCTION

GRAND LEDGE, MICHIGAN

Prepared For:

FISHBECK

Grand Rapids, Michigan

Prepared By:

MATERIALS TESTING CONSULTANTS, INC.

March 2023

MTC Project No. 221659

March 24, 2023
Project No. 221659

Fishbeck
1515 Arboretum Drive SE
Grand Rapids, Michigan, 49546

Attention: Michael Berrevoets, P.E.
Vice President

Reference: Report of Geotechnical Investigation
Grand Ledge Well 2 Raw Water Main Construction
Grand Ledge, Michigan

Dear Mr. Berrevoets:

We have completed a geotechnical investigation for the above-referenced project. The purpose of this investigation has been to identify the general subsurface soil conditions in the vicinity of the proposed water main construction, analyze the conditions relative to the planned construction and to provide geotechnical considerations associated with open cut and trenchless crossing installation methods. This work has been performed as described in our email dated January 18, 2023.

Presented herein are descriptions of our understanding of the design considerations, the geotechnical investigation, encountered conditions and geotechnical considerations. The Appendix contains the report limitations and data collected during this investigation.

DESIGN CONSIDERATIONS

Available Information

We have been provided the following documents and information for use in this investigation:

- A plan packet containing general details (Sheet No. 3), the raw water main overall alignment (Sheet No. 4), and the water main layout, stationing, installation method, size, pipe composition, depths, and existing conditions (Sheet Nos. 5 to 12), prepared by Fishbeck and dated January 20, 2023.
- Email correspondence with Mr. Mike Berrevoets, P.E. with Fishbeck and Mr. Kurt Ristow with the City of Grand Ledge Public Works Department regarding access and general project details and requirements.
- MDOT Forms 3702, Application Requirements for Trenchless Installations, dated January 2019.

Project Description

The proposed construction will be located in plan as shown on the attached Boring Location Plans, Figure Nos. 1 through 7.

The project will consist of the installation of approximately 5,700 lf of new 8-inch diameter, High-Density Polyethylene (HDPE), raw water main pipe. The water main will generally be placed from the Water Treatment Plant (Station 2+00, southern project limits) located immediately south of M-43 (Saginaw Highway) to Well 2 (Station 59+11, northern project limits) located within Jaycee Park between River Street and the Grand River. In order to minimize temporary earth retention required to support existing utilities and adjacent private property, a combination of open cut and trenchless pipe installation methods will be utilized, specifically Horizontal Direction Drilling (HDD), as summarized below.

- Open Cut Installation: Stations 2+00 to 9+36, 37+00 to 42+35 and 52+00 to 58+52
- HDD Installation: Stations 9+36 to 37+00 and 42+35 to 52+00

Pipe invert depths are proposed to range from approximately 6 to 11 ft below existing surface grades within open-cut installation areas with pipe depths as much as 18 ft proposed where HDD installation will be utilized. Invert elevations are proposed to range from els 785.5 to 845.5 in the vicinity of our boring locations.

We should be informed of any changes between the actual design conditions and those described herein as this information may affect our recommendations.

INVESTIGATION METHODOLOGY

Conventional soil test borings and 2.5-ft sampling along with field engineering reconnaissance were used to investigate the subsurface conditions. Boring locations are shown in Figure Nos. 1 to 7. Investigation procedures, soil classification information and boring logs are provided in the Appendix.

Number of Borings	14
Boring Depth Range, ft.	10.5 to 30

Borings were drilled and other sampling was conducted solely to obtain indications of subsurface conditions as part of a geotechnical exploration program. No services were performed to evaluate subsurface environmental conditions.

INVESTIGATION RESULTS

Regional Geology

The *Map of the Surface Formations of the Southern Peninsula of Michigan,* published by the State of Michigan, indicates the site is in an area of ground moraines. Soil conditions typically are found to be unsorted deposits of sand, silt, clay, gravel, and occasional cobble and boulder in this type of geologic area. The *Map of Bedrock Topography of the Southern Peninsula of Michigan* indicates bedrock to be at approximately els 800 to 850 relative to suspected top of bedrock encountered during the geotechnical study ranging from approximately els 782 to 805.

Site Conditions

At the time of our field work, the area of investigation grass areas within Jaycee Park and Water Treatment Plant property with a majority of the investigation completed within street right-of-way covered with HMA pavement. Several residential homes are present within 30 to 60 ft of the alignment as well as a gas station and business at the intersection of W Saginaw Highway and Degroff Street.

Subsurface Conditions

The investigation, in general, encountered 2 to 9 inches of HMA overlying 2 to 8 inches of gravel base or 2 to 9 inches of topsoil. Beneath the surficial material, a mixture of soil was encountered and classified as very loose to dense dark brown to gray poorly graded sand (SP) with varying amounts of gravel, medium dense brown poorly graded sand with silt (SP-SM), dense brown poorly graded gravel (GP) with sand, very loose to dense brown silty sand (SM), very loose to loose dark brown to gray clayey sand (SC), stiff to hard brown lean clay (CL), and loose to medium dense brown silt (ML) to termination. Fill soil was encountered within Borings B-6, B-9, and B-11 to a depth of 3 ft, Boring B-8 to a depth of 5.5 ft, and Borings B-12 and B-14 to a depth of 2.5 ft. Asphalt fragments were observed within the fill at Boring B-9.

Auger refusal and SPT refusal on suspected “competent” bedrock were encountered within Borings B-1 at a depth of 11.4 ft, B-2 at a depth of 10.5 ft, and B-3 at a depth of 20.5 ft. Poor recovery was noted within Borings B-3 Sample S-7 (16 to 17.5 ft), B-6 Sample S-8 (18.5 to 20 ft), B-11 Samples S-5 (11 to 12.5 ft), S-8 (18.5 to 20 ft), and S-9 (21 to 22.5 ft), B-12 Samples S-3 (6 to 7.5 ft), S-8 (18.5 to 20 ft), and S-10 (23.5 to 25 ft), and B-13 Sample S-1 (0 to 1.5 ft). Poor recovery could indicate the presence of possible coarse gravel or cobble. Whenever cobble is noted, boulder should be expected.

Groundwater was encountered within Borings B-1, B-3, B-7, B-8, and B-13 at elevations ranging from 787.3 to 828.5 ft. Seepage water from saturated sand seams was encountered within Boring B-8 at elevation 832.3. Groundwater levels may fluctuate due to seasonal variations such as precipitation, snowmelt, nearby river or lake levels and other factors that may not be evident at the time of measurement. Groundwater levels may be different at the time of construction.

Table 1 provides a summary of encountered subsurface conditions.

Table 1 – Summary of Encountered Subsurface Conditions

Boring No.	Approx. Station (ft)	Ground Surface El (ft)	Approx. Invert El (ft)	Soil Type at invert (USCS)	Encountered Groundwater El (ft)
B-1	58+50	792.8	785.5	SC/CL	787.3
B-2	53+00	793.1	791	SP/SC	NA
B-3	49+50	822.5	810	SP	813.5
B-4	45+75	844.7	828	SM	NA
B-5	42+25	848.3	841.5	CL	NA
B-6	37+75	852.4	845.5	SC	NA
B-7	31+00	848.9	835	CL	828.4
B-8	26+50	846.3	833	CL	832.3 (seepage) / 825.8 (groundwater)
B-9	20+25	846.9	836.5	SM/CL	NA
B-10	15+50	853	845	CL	NA
B-11	11+00	852.2	839.5	CL	NA
B-12	9+18	848.7	837.5	CL	NA
B-13	3+50	840.8	835	CL	828.5
B-14	1+50	846.3	840	CL/SC	NA

Note: NA indicates groundwater was not encountered at the time of drilling

This section has provided a generalized description of the encountered subsurface soil conditions. The boring logs located in the Appendix should be reviewed for detailed soil descriptions. Some variation between boring locations may be expected.

GEOTECHNICAL CONSIDERATIONS

In general, encountered subgrade at proposed water main invert elevations appears suitable for support. Occasional zones of very loose granular soil were encountered near the northern project limits which may require removal or densification prior to pipe bedding placement in order to achieve bedding/backfill compaction requirements.

Excavation support and protection of existing utilities will be an important component of the project and will be the sole responsibility of the Contractor to design, install and maintain. The Contractor should be prepared to support roadways, utilities and structures and provide a safe work environment in accord with all safety standards. Appropriate means and methods should be selected by the Contractor to assure that the construction can be completed in a safe manner. A pre-construction photograph or video survey is recommended for structures located within 50 ft of the proposed water main alignment to document existing conditions prior to construction.

Open Cut – Geotechnical Considerations

Bedding for the HDPE water main should consist of MDOT Class II sand with 100 percent of the material passing the 3/8-inch sieve. Backfill should consist of MDOT Class II sand below roadways with green space areas anticipated to be backfilled either with existing, non-organic material removed during pipe installation, placed as engineered fill, or MDOT Class II sand. Although some material likely meeting MDOT Class II gradation requirements is expected to be encountered during excavation activities (SP and SP-SM), we anticipate a majority of material needed for pipe bedding and backfill below roadways will need to be imported. We suggest that the budget consider all bedding and backfill to be imported with a unit deduct applied where on-site material is encountered which can be utilized for bedding/backfill.

Sand bedding and backfill should be compacted to 95 percent of its maximum dry density per the Modified Proctor method (ASTM D1557). Backfill within general green space areas may consider a reduced compaction requirement of 90 percent of the material's maximum ASTM D1557 dry density.

Horizontal Directional Drilling – Geotechnical Considerations

Based on the subsurface conditions encountered, we anticipate HDD methods to be feasible for qualified Contractors. The Contractor should be responsible for determining the means and methods for completing the HDD crossing including, but not necessarily limited to, maintaining hole stability and pulling the new pipe back through the hole while protecting all existing structures, pavement and utilities.

The ability to maintain the stability and diameter of the borehole should be considered when selecting the HDD drill alignment. This review should consider the pull force, bending, and tensile stresses that will be applied to the water main pipe during installation. Conservative design parameters should be considered to accommodate potential anomalies. An HDD rig should be mobilized with suitable pull-capacity and lifting for final pipe installation. The drilling fluid should be properly designed, and the HDD Contractor should select means and methods to prevent hydraulic fracturing of the overburden soil during the drilling and reaming process. Proper management of the drilling fluid will be necessary as well as proper reaming to clear debris and create smooth sidewalls prior to pipe pull back.

The HDD Contractor should be required to submit an installation plan at least 2 weeks prior to mobilization for review, summarizing the design drilling alignment, proposed equipment, drilling fluids, location and method of support for access pits and a lost circulation plan. We recommend the installation plan include a plan for corrective action should drilling communication with the ground or subsidence be observed requiring stabilization/repair.

In general, obstructions resulting in auger/sampler refusal were generally encountered below the proposed pipe invert depth and are anticipated to represent "competent" bedrock. Bedrock is expected to be encountered below the pipe invert depth; however, obstructions within the overburden soil may be encountered which could impact HDD progress including coarse gravel, cobble and potentially boulder. The borings encountered gravel of varying size near the proposed crossing alignment with the possibility of other, larger sized obstructions present based on the regional geology and conditions encountered in our borings. Additionally, very loose sand could increase the risk of frack-out, which should be considered by the Contractor. The Contractor should be aware of these encountered and potential conditions with the design and installation appropriately conducted in consideration of these potential challenges. Soil boring logs are provided to assist in the designing of the crossing. If additional borings or piezometers are deemed necessary to complete the design and installation, these should be completed by the Contractor as needed.

Settlement/heave monitoring is recommended during HDD installation. We recommend survey monitoring points be placed every 50 ft on-center (at a minimum) for this purpose along the centerline of pipe with the pavement edges and centerline of M-43 monitored. Monitoring should be capable of measuring vertical movement to 0.01 ft or less with digital photographs of the pavement taken prior to, during and after pipe installation. Should any surface disruption be detected, all operations should be immediately stopped and reviewed, followed by corrective action as necessary.

Groundwater

Groundwater was encountered at Borings B-1, B-3, B-7, B-8 and B-13 at elevations ranging from 787.3 to 832.3, approximately 2 to 4 ft above the proposed pipe invert elevation near the northern project limits with groundwater (where encountered) generally below the pipe invert at the southern project limits. Groundwater will be encountered, likely more prevalent at the north project limits where the pipe is both lower in elevation and closer in proximity to the Grand River.

HDD methods are expected to significantly reduce the need for groundwater control with groundwater anticipated to be encountered during open-cut installation within and near Jaycee Park and possibly other areas of the alignment. The Contractor will be responsible for selecting and implementing an appropriate groundwater control system. The Contractor should have previous dewatering experience on sites with similar conditions. Suitable silt and sediment traps should be incorporated into the dewatering system. We recommend the Contractor be prepared to temporarily lower groundwater a minimum of 2 ft below the bottom

of pipe bedding to allow for appropriate subgrade observation and preparation prior to placement of bedding.

Slopes and Temporary Excavations

The Contractor should make themselves aware of and become familiar with applicable local, state, and federal safety regulations, including current OSHA excavation and trench safety standards. Construction site safety generally is the sole responsibility of the Contractor. The Contractor shall also be solely responsible for the means, methods, techniques, sequences and operations of construction operations. We are providing the following information solely as a service on this project and, under no circumstances, should our provision of the following information be construed to mean that we are assuming responsibility for construction site safety or the Contractor's activities; such responsibility is not implied and should not be inferred.

The Contractor should be aware that slope height, slope inclination, and excavation depths (including utility trench excavations) should in no case exceed those specified in local, state, or federal safety regulations; e.g., OSHA Health and Safety Standards for Excavations, 29 CFR Part 1926, or successor regulations. For this site, the overburden soil encountered in our exploratory program is a combination of cohesive and granular soil. We anticipate that OSHA will classify these materials as Types A and C, respectively. OSHA recommends a maximum slope inclination of ¾H:1V for Type A and 1½H:1V for Type C soil under ideal conditions.

As an alternative to temporary slopes, vertical excavations can be temporarily shored. The Contractor should be responsible for the design of the temporary shoring in accordance with applicable regulatory requirements. We anticipate the Contractor will utilize trench box methods where temporary slopes are not utilized, however, should other forms of earth retention be considered, we recommend these systems be non-vibratory.

CLOSURE

In this report, descriptions of the geotechnical investigation, encountered conditions and considerations for the design of the proposed trenchless crossing have been presented. The limitations of this study are described in the Appendix.

The recommendations presented in this report are based upon a limited number of subsurface samples obtained from various sampling locations. The samples may not fully indicate the nature and extent of the variations that actually exist between sampling locations. For that reason, among others, we strongly recommend that a qualified geotechnical firm be retained to observe and document the trenchless crossing. If variations or other latent conditions become evident during construction, it will be necessary for us to review these conditions and our considerations as appropriate.

We appreciate the opportunity to provide this service to you on this project. Should you have any questions or require further assistance, please contact our office.

Sincerely,

MATERIALS TESTING CONSULTANTS, INC.

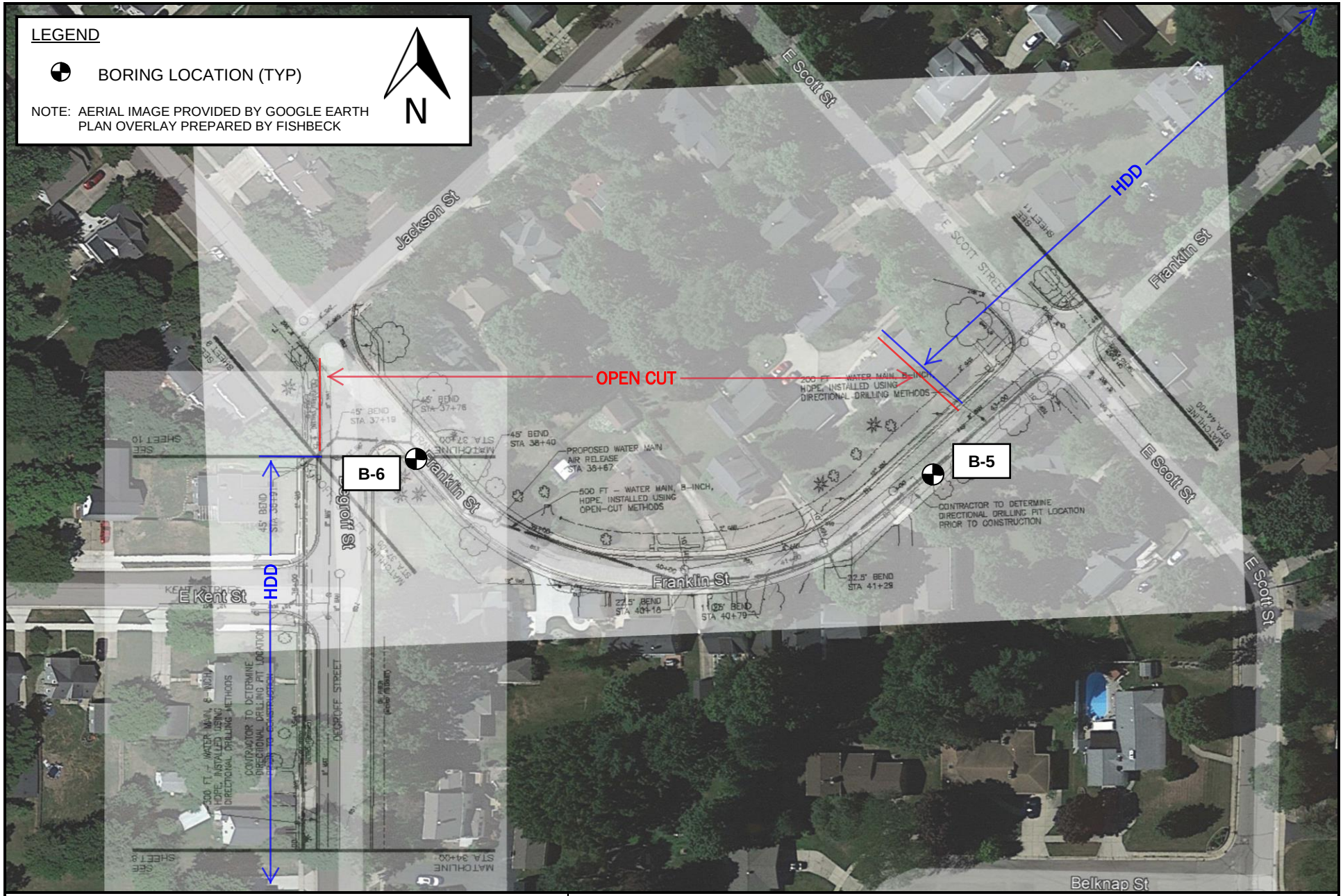
Chelsea L. Kennedy, E.I.T.
Assistant Project Engineer

Todd D. Munger, P.E.
Senior Project Manager

Attachments: Figure Nos. 1 to 7 - Boring Location Plan
Appendix
- Limitations
- Test Drilling and Sampling Procedures
- Boring Log Terminology and Classification Outline
- Boring Logs

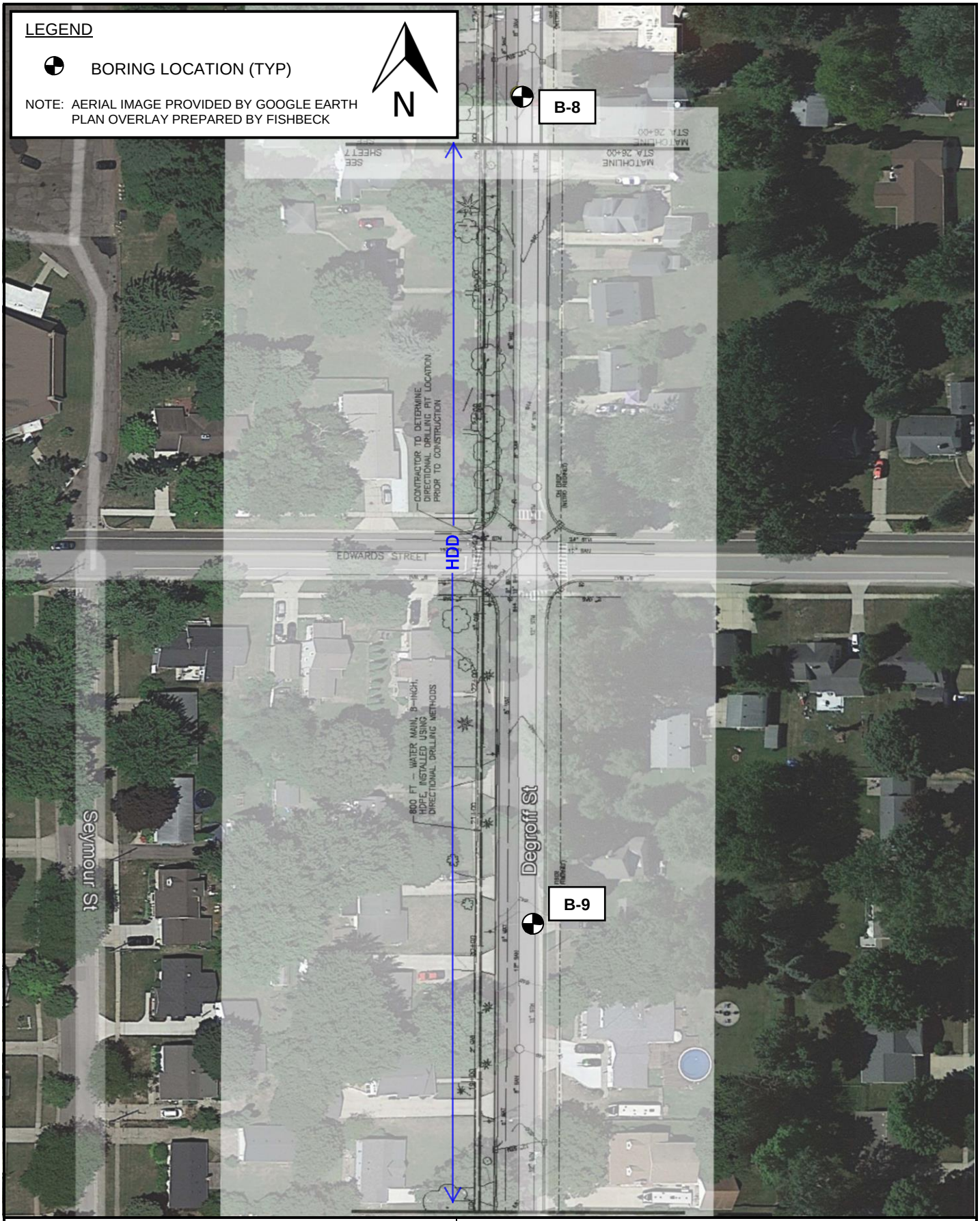
TITLE: BORING LOCATION PLAN – 52+50 TO 58+50		PROJECT: GRAND LEDGE WELL 2 RAW WATER MAIN CONSTRUCTION	
SCALE: NS	DATE: 3/6/23	PROJECT NO.: 221659	MTC MATERIALS TESTING CONSULTANTS
FIG. NO.: 1	DR. BY: CK	REV. BY: TM	

TITLE: BORING LOCATION PLAN – STA 44+00 TO 52+50		PROJECT: GRAND LEDGE WELL 2 RAW WATER MAIN CONSTRUCTION	
SCALE: NS	DATE: 3/6/23	PROJECT NO.: 221659	MTC MATERIALS TESTING CONSULTANTS
FIG. NO.: 2	DR. BY: CK	REV. BY: TM	



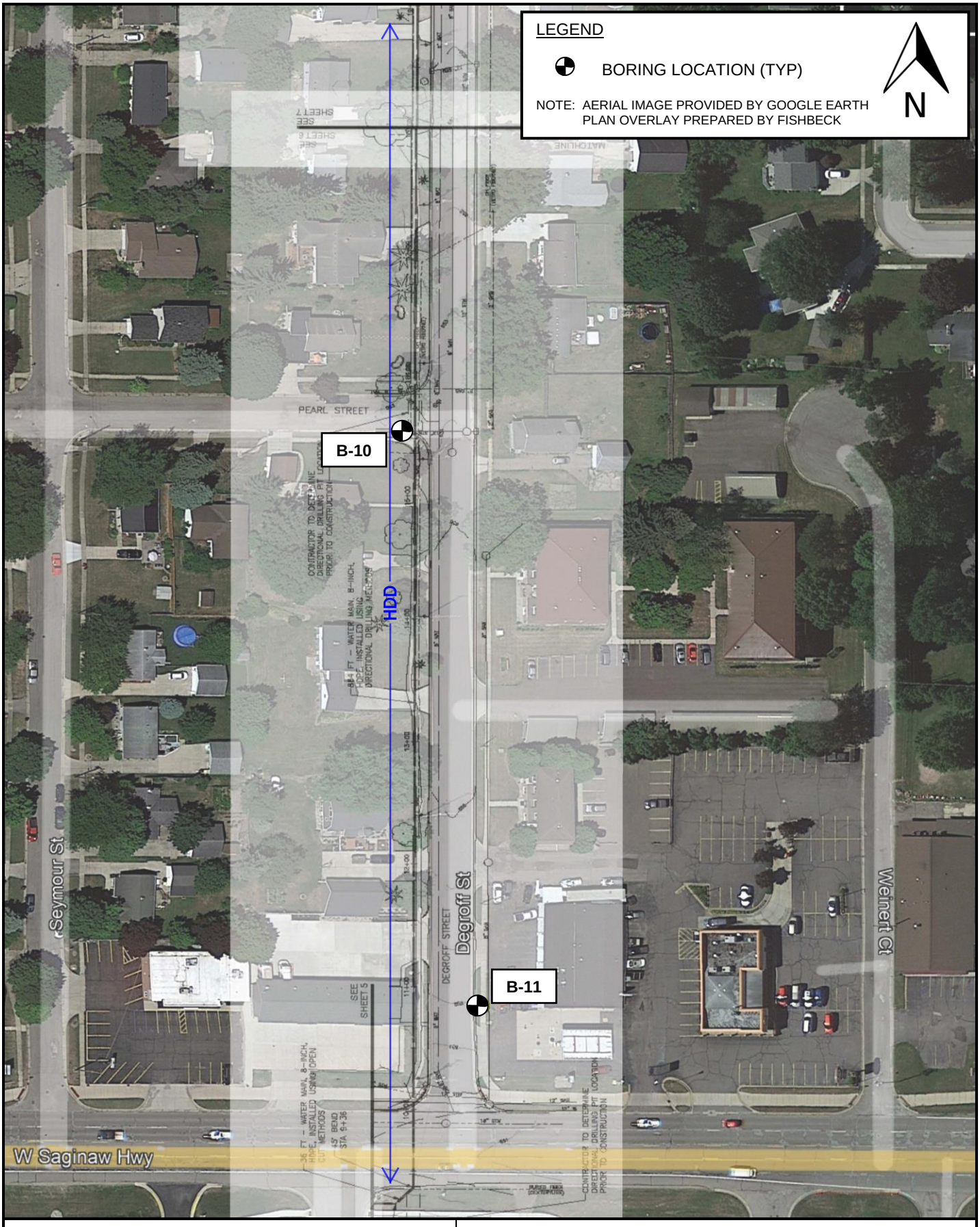
TITLE: BORING LOCATION PLAN – STA 34+00 TO 44+00		PROJECT: GRAND LEDGE WELL 2 RAW WATER MAIN CONSTRUCTION	
SCALE: NS	DATE: 3/15/23	PROJECT NO.: 221659	MTC MATERIALS TESTING CONSULTANTS
FIG. NO.: 3	DR. BY: CK	REV. BY: TM	

TITLE: BORING LOCATION PLAN – STA 25+50 TO 35+50			PROJECT: GRAND LEDGE WELL 2 RAW WATER MAIN CONSTRUCTION
SCALE: NS	DATE: 3/15/23	PROJECT NO.: 221659	MTC MATERIALS TESTING CONSULTANTS
FIG. NO.: 4	DR. BY: CK	REV. BY: TM	



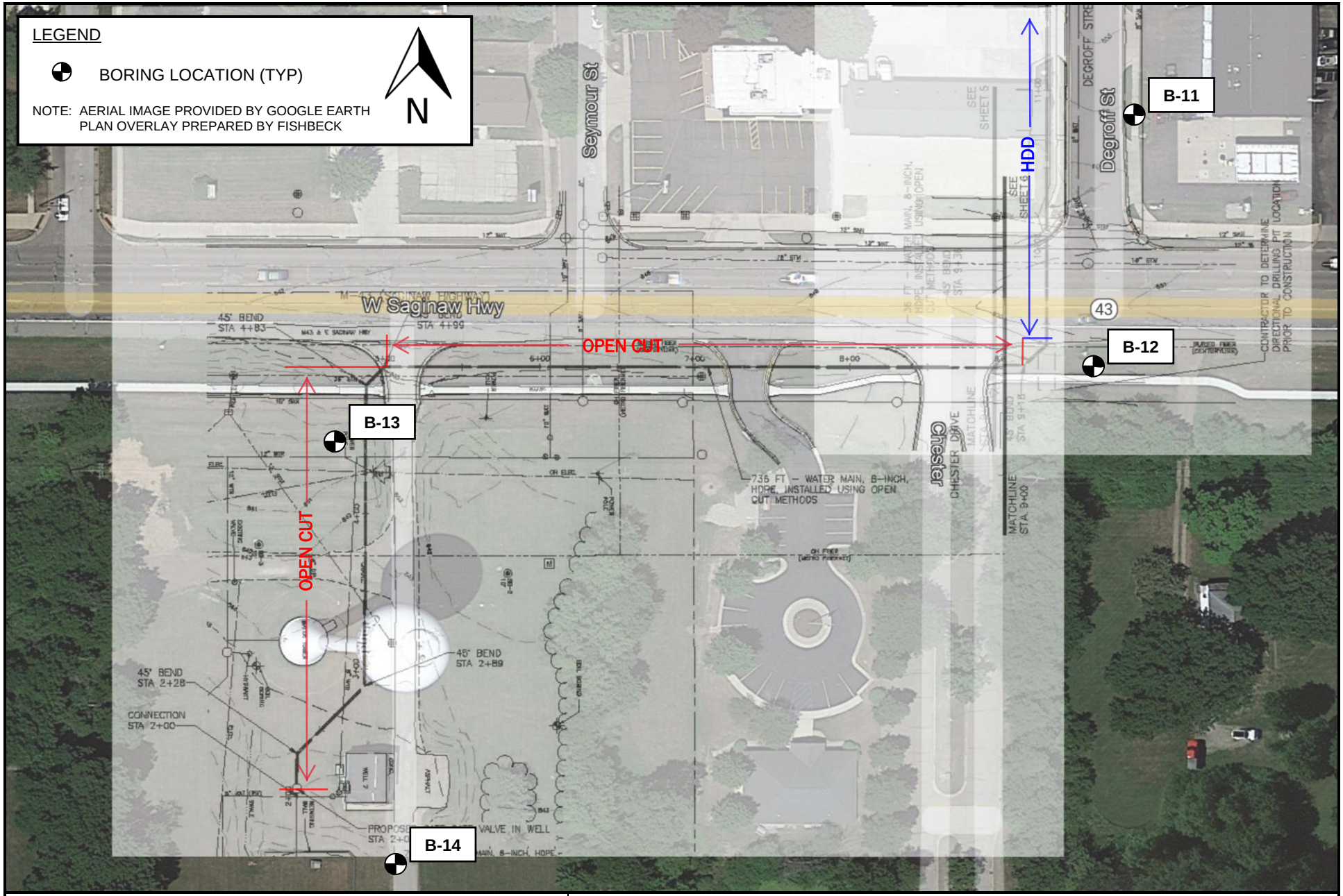
TITLE: BORING LOCATION PLAN – STA 19+00 TO 27+00		PROJECT: GRAND LEDGE WELL 2 RAW WATER MAIN CONSTRUCTION
SCALE: NS	DATE: 3/15/23	PROJECT NO.: 221659
FIG. NO.: 5	DR. BY: CK	REV. BY: TM

MTC MATERIALS TESTING CONSULTANTS



TITLE: BORING LOCATION PLAN – STA 9+36 TO 19+00		PROJECT: GRAND LEDGE WELL 2 RAW WATER MAIN CONSTRUCTION
SCALE: NS	DATE: 3/6/23	PROJECT NO.: 221659
FIG. NO.: 6	DR. BY: CK	REV. BY: TM

MTC MATERIALS TESTING CONSULTANTS



TITLE: BORING LOCATION PLAN – STA 1+50 TO 11+50		PROJECT: GRAND LEDGE WELL 2 RAW WATER MAIN CONSTRUCTION	
SCALE: NS	DATE: 3/6/23	PROJECT NO.: 221659	MTC MATERIALS TESTING CONSULTANTS
FIG. NO.: 7	DR. BY: CK	REV. BY: TM	

LIMITATIONS

Soil Variations

The recommendations in this report are based upon the data obtained from the soil borings. This report does not reflect variations which may occur between these borings, and which would not become evident until construction. If variations then become evident, it would be necessary for a re-evaluation of recommendations of this report, after performing on-site observations.

Warranties

We have prepared this report in accordance with generally accepted soil and foundation engineering practices. We make no other warranties, either expressed or implied, as to the professional advice provided under the terms of our agreement and included in this report. This report is prepared exclusively for our client and may not be relied upon by other parties without written consent from our office.

Boring Logs

In the process of obtaining and testing samples and preparing this report, we follow reasonable and accepted practice in the field of soil engineering. Field logs maintained during drilling describe field occurrences, sampling locations, and other information. The samples obtained in the field are subjected to additional testing in the laboratory and differences may exist between the field logs and the final logs. The engineer reviews the field logs and laboratory test data, and then prepares the final boring logs. Our recommendations are based on the contents of the final logs.

Review of Design Plans and Specifications

In the event that any changes in the design of the building or the location, however slight, are planned, our recommendations shall not be considered valid unless modified or approved in writing by our office. We recommend that we be provided the opportunity to review the final design and specifications in order to determine whether changes in the original concept may have affected the validity of our recommendations, and whether our recommendations have, in fact, been implemented in the design and specifications.

TEST DRILLING AND SAMPLING PROCEDURES

Test Drilling Methods:

- [X] Hollow stem auger, ASTM D6151
- [ ] Mud rotary, ASTM D5783
- [ ] Casing advancer, ASTM D5872
- [ ] Rock coring, ASTM D2113
- [ ] Cone Penetration Testing, ASTM D5778

Note: Cone penetration test data can be used to interpret subsurface stratigraphy and can provide data on engineering properties of soils. The ASTM procedure does not include a procedure for determining soil classification from CPT testing. Soil classifications shown on CPT logs are based on published procedures and are not based on physical ASTM soil classification tests.

Sampling Methods:

- [X] SPT, ASTM D1586, CME Auto hammer (140 lb., 30" drop, 2" OD split spoon sampler)
- [ ] Thin-walled tube sampler (Shelby), ASTM D1587

Note: The number of hammer blows required to drive the SPT sampler 12 inches, after seating 6 inches, is termed the soil N-value and provides an indication of the soil's relative density and strength parameters at the sample location. SPT blow counts in 6 inch increments are recorded on the boring logs.

Drill Rig:

- [X] Geoprobe 7822 (ATV)
- [ ] CME 750 Rubber tired (ATV)
- [ ] CME 95 Truck
- [ ] Geoprobe Direct Push
- [ ] Geoprobe Rotary Sonic

Boreholes Backfilled With:

- [X] Excavated soil
- [X] Cement bentonite grout
- [ ] Piezometer or Monitoring Well (see notes on logs)
- [X] Concrete or asphalt patch where appropriate

Sample Handling and Disposition:

- [X] SPT samples labeled, placed in jars, returned to MTC Laboratory
- [X] Discard after 60 days

BORING LOG TERMINOLOGY AND ASTM D 2488 CLASSIFICATION OUTLINE

TERMS DESCRIBING CONSISTENCY OR CONDITION

COARSE-GRAINED SOILS (major portions retained on No. 200 sieve): includes (1) clean gravel and sands and (2) silty or clayey gravels and sands. Condition is rated according to relative density as determined by laboratory tests or standard penetration resistance tests.

Descriptive Terms	Relative Density	SPT Blow Count
Very loose	0 to 15 %	< 5
Loose	15 to 35 %	5 to 10
Medium dense	35 to 65 %	10 to 30
Dense	65 to 85 %	30 to 50
Very dense	85 to 100 %	> 50

Per ASTM D2487, the following conditions must be met based on laboratory testing to justify the label 'well graded' in a soil description.

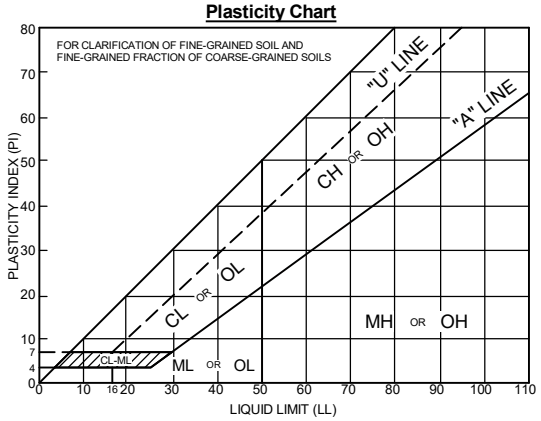
Gravel: $C_U = \frac{D_{60}}{D_{10}}$ greater than 4; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3

Sand: $C_U = \frac{D_{60}}{D_{10}}$ greater than 6; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3

FINE-GRAINED SOILS (major portions passing on No. 200 sieve): includes (1) inorganic and organic silts and clays, (2) gravelly, sandy, or silty clays, and (3) clayey silts. Consistency is rated according to shearing strength, as indicated by penetrometer readings, SPT blow count, or unconfined compression tests.

Descriptive Terms	Unconfined Compressive Strength TSF	SPT Blow Count
Very soft	< 0.25	< 2
Soft	0.25 to 0.5	2 to 4
Medium stiff	0.5 to 1.0	4 to 8
Stiff	1.0 to 2.0	8 to 15
Very stiff	2.0 to 4.0	15 to 30
Hard	> 4.0	> 30

Plasticity Chart



MAJOR DIVISIONS					TYPICAL NAMES
COARSE-GRAINED SOILS MORE THAN HALF IS COARSER THAN NO. 200 SIEVE	GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN GRAVELS WITH LESS THAN 15% FINES	GW		WELL-GRADED GRAVELS WITH OR WITHOUT SAND
			GP		POORLY-GRADED GRAVELS WITH OR WITHOUT SAND
		GRAVELS WITH 15% OR MORE FINES	GM		SILTY GRAVELS WITH OR WITHOUT SAND
			GC		CLAYEY GRAVELS WITH OR WITHOUT SAND
	SANDS MORE THAN HALF COARSE FRACTION IS FINER THAN NO. 4 SIEVE SIZE	CLEAN SANDS WITH LESS THAN 15% FINES	SW		WELL-GRADED SANDS WITH OR WITHOUT GRAVEL
			SP		POORLY-GRADED SANDS WITH OR WITHOUT GRAVEL
			SP-SM		POORLY-GRADED SANDS WITH SILT WITH OR WITHOUT GRAVEL
		SANDS WITH 15% OR MORE FINES	SM		SILTY SANDS WITH OR WITHOUT GRAVEL
			SC		CLAYEY SANDS WITH OR WITHOUT GRAVEL
FINE-GRAINED SOILS MORE THAN HALF IS FINER THAN NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT 50% OR LESS		ML		INORGANIC SILTS OF LOW TO MEDIUM PLASTICITY WITH OR WITHOUT SAND OR GRAVEL
			CL		INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY WITH OR WITHOUT SAND OR GRAVEL
			OL		ORGANIC SILTS OR CLAYS OF LOW TO MEDIUM PLASTICITY WITH OR WITHOUT SAND OR GRAVEL
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50%		MH		INORGANIC SILTS OF HIGH PLASTICITY WITH OR WITHOUT SAND OR GRAVEL
			CH		INORGANIC CLAYS OF HIGH PLASTICITY WITH OR WITHOUT SAND OR GRAVEL
			OH		ORGANIC SILTS OR CLAYS OF HIGH PLASTICITY WITH OR WITHOUT SAND OR GRAVEL
HIGHLY ORGANIC SOILS			PT/OL		PEAT AND OTHER HIGHLY ORGANIC SOILS

GENERAL NOTES

1. Classifications are based on the United Soil Classification System and include consistency, moisture, and color. Field descriptions have been modified to reflect results of laboratory tests where deemed appropriate.

2. "Grades with" or "Grades without" may be used to describe soil when characteristics vary within a stratum.

3. Preserved soil samples will be discarded after 60 days unless alternate arrangements have been made.

GROUNDWATER OBSERVATIONS:

During - indicates water level encountered during the boring
End- indicates water level immediately after drilling
Date and Depth - Measurements at indicated date

SAMPLE TYPES AND NUMBERING

S	SPT, split barrel sample, ASTM D1586
U	Shelby tube sample, ASTM D1587
R	Rock core run
*S	Other than 2" split barrel sample
L	SPT with liner, ASTM D1586
A	Auger cuttings
G	Geoprobe liner

MINOR COMPONENT QUANTIFYING TERMS

Less than 5%	TRACE
5 to 10%	FEW
15 to 25%	LITTLE
30 to 40%	SOME
50 to 100%	MOSTLY

GRAIN SIZE

BOULDER	>12"
COBBLE	12" to 3"
COARSE GRAVEL	3" to 0.75"
FINE GRAVEL	0.75" to No. 4
COARSE SAND	No. 4 to No. 10
MEDIUM SAND	No. 10 to No.40
FINE SAND	No. 40 to No. 200

APPENDIX

- Limitations
- Test Drilling and Sampling Procedures
- Boring Log Terminology and Classification Outline
- Boring Logs

LOG OF BORING

Project No.: 221659
Boring No.: B-1
Sheet: 1 of 1

Project: Grand Ledge Well 2 Raw Watermain Construction
Client: Fishbeck
Location: Grand Ledge, Michigan
Drill Type: Geoprobe 7822
Crew Chief: MDS Field Eng.: MS Rev. By: CK
Coordinates: N=456296.8 E=13022723.7 (MI South ift)
Elevation: 792.8 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch. Cave in at 7.0 ft.

Date Begin: 02/14/2023 Date End: 02/14/2023

Tooling	Type	Dia.	Groundwater, ft.	
Casing	HSA	4 1/4"	During	5.5 ±
Sampler	SPT	2"	End	5.0
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer	Auto			

Depth Drilled: 11.4 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Penetration (Blows Per 6") ASTM D 1586	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
791.8	1	S-1	1.5	13-10-6 N=16		4" HMA (0.3)				
790.8	2				SP	4" Gravel Base (0.7)				
789.8	3					Brown gray poorly graded SAND; mostly medium to fine sand, few fine gravel, trace silty fines, moist (2.5)				
788.8	4	S-2	1.5	2-1-1 N=2	SC	Dark brown to gray clayey SAND; mostly medium to fine sand, some clayey fines, trace fine gravel, moist				
787.8	5					Grades wet				
786.8	6									
785.8	7	S-3	1.5	WOH/12"-2						WOH: Weight of Hammer
784.8	8					(8.0)				
783.8	9	S-4	1.5	5-6-6 N=12	CL	Brown lean CLAY; mostly clayey fines, few fine sand, trace fine gravel, moist	3.5			
782.8	10					(10.5)				
781.8	11				SH	Highly weathered gray SHALE (11.4)				
		S-5	0.9	43-50/5"		End of Boring				Auger refusal at 10.5' due to bedrock. Drove SPT sample at 10.5' and got SPT refusal at 11.4' due to bedrock.

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 221659
Boring No.: B-2
Sheet: 1 of 1

Project: Grand Ledge Well 2 Raw Watermain Construction
Client: Fishbeck
Location: Grand Ledge, Michigan
Drill Type: Geoprobe 7822
Crew Chief: MDS Field Eng.: MS Rev. By: CK
Coordinates: N=455858.1 E=13023115.1 (MI South ift)
Elevation: 793.1 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch. Cave in at 3.0 ft.

Date Begin: 02/14/2023 Date End: 02/14/2023

Tooling	Type	Dia.	Groundwater, ft.	
Casing	HSA	4 1/4"	During	None
Sampler	SPT	2"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer	Auto			

Depth Drilled: 10.5 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Penetration (Blows Per 6") ASTM D 1586	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
792.1	1	S-1	1.5	29-34-19 N=53		5 1/2" HMA (0.4)				
791.1	2				SP	6" Gravel Base (1.0)				
790.1	3					Brown poorly graded SAND; mostly coarse to fine sand, few fine gravel, trace silty fines, moist (2.5)				
789.1	4	S-2	1.5	2-1-2 N=3	SC					
788.1	5					Brown clayey SAND; mostly fine sand, some clayey fines, moist (5.5)				
787.1	6									
786.1	7	S-3	1.5	1/12"-1	SP	Dark brown to gray poorly graded SAND; mostly medium to fine sand, trace silty fines, trace fine gravel, moist (8.5)				
785.1	8									
784.1	9	S-4	1.5	10-32-50/4"	SH	Highly weathered gray SHALE (10.5)				
783.1	10									
						End of Boring				Auger refusal at 10.5' due to bedrock

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 221659
Boring No.: B-3
Sheet: 1 of 1

Project: Grand Ledge Well 2 Raw Watermain Construction
Client: Fishbeck
Location: Grand Ledge, Michigan
Drill Type: Geoprobe 7822
Crew Chief: MDS Field Eng.: MS Rev. By: CK
Coordinates: N=455615.5 E=13022849.3 (MI South ift)
Elevation: 822.5 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Grouted borehole with cement bentonite slurry, patched pavement with coldpatch.

Date Begin: 02/15/2023 Date End: 02/15/2023

Tooling	Type	Dia.	Groundwater, ft.	
Casing	HSA	4 1/4"	During	9.0
Sampler	SPT	2"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer	Auto			

Depth Drilled: 20.5 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Penetration (Blows Per 6") ASTM D 1586	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
821.5	1	S-1	1.5	10-9-8 N=17		4 1/2" HMA 0.4 6" Gravel Base 0.9				
820.5	2				SP	Brown poorly graded SAND; mostly medium to fine sand, trace silty fines, trace fine gravel, moist				
819.5	3									
818.5	4	S-2	1.5	4-4-4 N=8		Grades mostly fine				
817.5	5					5.5				
816.5	6				SM	Brown silty SAND; mostly fine sand, little silty fines, moist				WOH: Weight of Hammer
815.5	7	S-3	1.5	WOH-2-2 N=4						
814.5	8									
813.5	9	S-4	1.5	3-2-2 N=4		Grades wet				
812.5	10					10.5				Charged augers with water from 10.0'
811.5	11				SP	Brown poorly graded SAND; mostly fine sand, trace silty fines, wet				
810.5	12	S-5	1.5	4-5-6 N=11						
809.5	13									
808.5	14	S-6	1.5	6-8-11 N=19		Grades with trace fine gravel				
807.5	15					15.5				
806.5	16				CL	Gray lean CLAY; mostly clayey fines, trace fine gravel, moist	1.5			Driller noted COBBLE at 15.5'
805.5	17	S-7	0.2	9-9-11 N=20						S-7: Poor recovery; possible coarse gravel / COBBLE. Two attempts were made.
804.5	18					18.0				
803.5	19					Highly weathered gray SHALE				
802.5	20	S-8	0.8	32-50/3"						
		S-9	0.5	50/3.5"		20.5				
						End of Boring				Auger refusal at 20.0' due to bedrock. Drove SPT sample at 20.0'. SPT refusal at 20.5 due to bedrock.

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 221659
Boring No.: B-4
Sheet: 1 of 1

Project: Grand Ledge Well 2 Raw Watermain Construction
Client: Fishbeck
Location: Grand Ledge, Michigan
Drill Type: Geoprobe 7822
Crew Chief: MDS Field Eng.: MS Rev. By: CK
Coordinates: N=455373.1 E=13022573.4 (MI South ift)
Elevation: 844.7 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Grouted borehole with cement bentonite slurry, patched pavement with coldpatch.

Date Begin: 02/15/2023 Date End: 02/15/2023

Tooling	Type	Dia.	Groundwater, ft.	
Casing	HSA	4 1/4"	During	None
Sampler	SPT	2"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer	Auto			

Depth Drilled: 30.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Penetration (Blows Per 6") ASTM D 1586	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
843.7	1	S-1	1.5	4-6-5 N=11		3 1/2" HMA (0.3)				
842.7	2					2" Gravel Base (0.4)				
841.7	3				SP	Brown poorly graded SAND; mostly fine sand, trace silty fines, moist				
840.7	4					4.0				
839.7	5	S-2	1.5	2-3-4 N=7		Brown lean CLAY; mostly clayey fines, trace fine sand, trace fine gravel, moist	2.0			
838.7	6									
837.7	7	S-3	1.5	3-4-5 N=9			2.5			
836.7	8									
835.7	9									
834.7	10	S-4	1.5	2-3-6 N=9	CL	Grades with sand lenses	2.25			
833.7	11									
832.7	12	S-5	1.5	8-11-14 N=25		Grades without sand lenses	3.5			
831.7	13									
830.7	14									
829.7	15	S-6	1.5	7-15-11 N=26			4.0			
828.7	16					15.5				
827.7	17	S-7	1.5	9-13-14 N=27	SM	Brown silty SAND; mostly fine sand, some silty fines, moist				
826.7	18									
825.7	19					19.5				
824.7	20	S-8	1.5	19-23-24 N=47	GP	Brown poorly graded GRAVEL with sand; mostly medium to fine gravel, little coarse to fine sand, moist				
823.7	21					21.5				
822.7	22	S-9	1.5	42-18-20 N=38	SM	Brown silty SAND; mostly fine sand, some silty fines, moist				
821.7	23									
820.7	24									
819.7	25	S-10	1.5	49-18-21 N=39						
818.7	26					25.5				
817.7	27	S-11	1.5	16-21-28 N=49	SP	Brown poorly graded SAND; mostly fine sand, trace silty fines, moist				
816.7	28									
815.7	29									
814.7	30	S-12	1.5	11-16-20 N=36		30.0				
						End of Boring				

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 221659
Boring No.: B-5
Sheet: 1 of 1

Project: Grand Ledge Well 2 Raw Watermain Construction
Client: Fishbeck
Location: Grand Ledge, Michigan
Drill Type: Geoprobe 7822
Crew Chief: MDS Field Eng.: MS Rev. By: CK
Coordinates: N=455135.5 E=13022300.9 (MI South ift)
Elevation: 848.3 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch. Cave in at 19.3 ft.

Date Begin: 02/15/2023 Date End: 02/15/2023

Tooling	Type	Dia.	Groundwater, ft.	
Casing	HSA	4 1/4"	During	None
Sampler	SPT	2"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer	Auto			

Depth Drilled: 25.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Penetration (Blows Per 6") ASTM D 1586	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
847.3	1	S-1	1.5	6-5-4 N=9		2" HMA (0.2) / 3" Gravel Base (0.4)	3.0			
846.3	2					Brown lean CLAY; mostly clayey fines, few fine sand, trace fine gravel, moist				
845.3	3									
844.3	4	S-2	1.5	2-2-5 N=7			2.5			
843.3	5									
842.3	6									
841.3	7	S-3	1.5	4-8-13 N=21	CL		3.25			
840.3	8									
839.3	9	S-4	1.5	5-7-8 N=15		Grades with trace fine sand	3.0			
838.3	10									
837.3	11									
836.3	12	S-5	1.5	5-6-8 N=14			2.0			
835.3	13					(13.0)				
834.3	14	S-6	1.5	6-5-6 N=11	CL	Gray lean CLAY; mostly clayey fines, trace fine gravel, moist	1.75			
833.3	15									
832.3	16									
831.3	17	S-7	1.5	5-8-13 N=21		(17.5)				
830.3	18				ML	Brown SILT; mostly silty fines, trace fine sand, moist (18.0)				
829.3	19									
828.3	20	S-8	1.5	9-7-8 N=15	CL	Brown lean CLAY; mostly clayey fines, trace fine gravel, trace fine sand, moist	2.0			
827.3	21					(21.5)				
826.3	22	S-9	1.5	18-18-20 N=38	SM	Brown silty SAND; mostly fine sand, little silty fines, moist				
825.3	23									
824.3	24									
823.3	25	S-10	1.5	14-14-16 N=30		(25.0)				
						End of Boring				

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 221659
Boring No.: B-6
Sheet: 1 of 1

Project: Grand Ledge Well 2 Raw Watermain Construction
Client: Fishbeck
Location: Grand Ledge, Michigan
Drill Type: Geoprobe 7822
Crew Chief: MDS Field Eng.: JV Rev. By: CK
Coordinates: N=455155.7 E=13021909.0 (MI South ift)
Elevation: 852.4 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch. Cave in at 8.0 ft.

Date Begin: 02/17/2023 Date End: 02/17/2023

Tooling	Type	Dia.	Groundwater, ft.	
Casing	HSA	4 1/4"	During	None
Sampler	SPT	2"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer	Auto			

Depth Drilled: 20.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Penetration (Blows Per 6") ASTM D 1586	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
851.4	1	S-1	1.4	25-9-7 N=16		6" HMA (0.5)				Fill: 0' to 3.0'
850.4	2					8" Gravel Base (1.2)				
849.4	3				SP-SM	Brown poorly graded SAND with silt; mostly coarse to fine sand, few silty fines, trace coarse to fine gravel, moist, Fill (3.0)				
848.4	4	S-2	1.5	4-4-4 N=8						
847.4	5				SC	Brown clayey SAND; mostly coarse to fine sand, little clayey fines, few coarse to fine gravel, moist with clay lenses				
846.4	6									
845.4	7	S-3	1.5	6-5-5 N=10		Grades with clay lenses from 6.0' to 7.0'	4.5+			
844.4	8					(8.0)				
843.4	9	S-4	1.5	4-4-5 N=9		Brown SILT; mostly silty fines, few fine sand, moist				
842.4	10									
841.4	11				ML					
840.4	12	S-5	1.5	8-9-12 N=21						
839.4	13									
838.4	14	S-6	1.5	6-8-9 N=17						
837.4	15					(14.7)	4.5+			
836.4	16					Brown lean CLAY; mostly clayey fines, few coarse to fine gravel, few coarse to fine sand, moist				
835.4	17	S-7	1.5	8-9-11 N=20			4.5+			
834.4	18				CL					S-8: Poor recovery; possible coarse gravel / COBBLE
833.4	19	S-8	1.2	9-11-16 N=27			1.0			
832.4	20					(20.0)				
						End of Boring				

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 221659
Boring No.: B-7
Sheet: 1 of 1

Project: Grand Ledge Well 2 Raw Watermain Construction
Client: Fishbeck
Location: Grand Ledge, Michigan
Drill Type: Geoprobe 7822
Crew Chief: MDS Field Eng.: ES Rev. By: CK
Coordinates: N=454564.4 E=13021871.4 (MI South ift)
Elevation: 848.9 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Grouted borehole with cement bentonite slurry, patched pavement with coldpatch.

Date Begin: 02/16/2023 Date End: 02/16/2023

Tooling	Type	Dia.	Groundwater, ft.	
Casing	HSA	4 1/4"	During	20.5
Sampler	SPT	2"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer	Auto			

Depth Drilled: 25.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Penetration (Blows Per 6") ASTM D 1586	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
847.9	1					6" HMA (0.5)				
846.9	2	S-1	1.5	25-8-7 N=15	SP-SM	6" Gravel Base (1.0) Brown poorly graded SAND with silt; mostly fine sand, few silty fines, moist (3.0)				
845.9	3									
844.9	4	S-2	1.5	2-3-4 N=7	CL	Brown lean mottled CLAY with sand; mostly clayey fines, little coarse to fine sand, moist with frequent silt seams and coarse to fine sand lenses (5.5)	2.5			
843.9	5									
842.9	6									
841.9	7	S-3	1.5	6-6-8 N=14	CL	Brown lean CLAY; mostly clayey fines, few medium to fine sand, moist with occasional clayey sand lenses	2.25			
840.9	8									
839.9	9	S-4	1.5	5-6-8 N=14		Grades gray without clayey sand lenses	2.5			
838.9	10									
837.9	11									
836.9	12	S-5	1.5	5-6-8 N=14			1.25			
835.9	13									
834.9	14	S-6	1.5	5-8-11 N=19			1.75			
833.9	15					(15.5)				
832.9	16									
831.9	17	S-7	1.5	3-4-6 N=10	CL	Gray lean CLAY; mostly clayey fines, trace medium to fine sand, moist	2.25			
830.9	18									
829.9	19	S-8	1.5	11-13-16 N=29			1.5			
828.9	20					(20.5)				
827.9	21									
826.9	22	S-9	1.5	8-9-12 N=21	ML	Gray sandy SILT; mostly silty fines, some coarse to fine sand, wet with frequent coarse to fine sand lenses Grades without coarse to fine sand lenses				
825.9	23									
824.9	24	S-10	1.5	9-10-11 N=21		Grades with occasional weathered sandstone pieces (25.0)				
823.9	25									
						End of Boring				

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 221659
Boring No.: B-8
Sheet: 1 of 1

Project: Grand Ledge Well 2 Raw Watermain Construction
Client: Fishbeck
Location: Grand Ledge, Michigan
Drill Type: Geoprobe 7822
Crew Chief: MDS Field Eng.: MS Rev. By: CK
Coordinates: N=454097.8 E=13021850.0 (MI South ift)
Elevation: 846.3 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Grouted borehole with cement bentonite slurry, patched pavement with coldpatch.

Date Begin: 02/14/2023 Date End: 02/14/2023

Tooling	Type	Dia.	Groundwater, ft.	
Casing	HSA	4 1/4"	During	20.5
Sampler	SPT	2"	End	NA
Core			Seepage	14.0
Tube			Date	Depth, ft.
SPT Hammer	Auto			

Depth Drilled: 25.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Penetration (Blows Per 6") ASTM D 1586	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
845.3	1					9" HMA 0.8				Fill: 0' to 5.5'
844.3	2	S-1	1.5	30-13-12 N=25		6" Gravel Base 1.3				
843.3	3				SP	Brown poorly graded SAND; mostly fine sand, trace silty fines, moist, Fill				
842.3	4									
841.3	5	S-2	1.5	4-4-7 N=11		5.5				
840.3	6									
839.3	7	S-3	1.5	3-4-7 N=11		Gray lean CLAY; mostly clayey fines, trace fine gravel, moist	2.25			
838.3	8									
837.3	9									
836.3	10	S-4	1.5	3-4-5 N=9			3.0			
835.3	11									
834.3	12	S-5	1.5	6-7-10 N=17			4.25			
833.3	13				CL					
832.3	14									
831.3	15	S-6	1.5	4-5-6 N=11		Grades with wet silt lenses	3.25			
830.3	16									
829.3	17	S-7	1.5	7-7-9 N=16		Grades without silt lenses	4.5+			
828.3	18									
827.3	19									
826.3	20	S-8	1.5	5-5-6 N=11		Grades with sand lenses	3.0			
825.3	21					20.5				
824.3	22	S-9	1.5	12-12-11 N=23		Gray poorly graded SAND with gravel; mostly coarse to fine sand, few fine gravel, trace silty fines, wet				
823.3	23				SP					
822.3	24									
821.3	25	S-10	1.5	9-9-10 N=19		25.0				
						End of Boring				

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 221659
Boring No.: B-9
Sheet: 1 of 1

Project: Grand Ledge Well 2 Raw Watermain Construction
Client: Fishbeck
Location: Grand Ledge, Michigan
Drill Type: Geoprobe 7822
Crew Chief: MDS Field Eng.: ES Rev. By: CK
Coordinates: N=453479.5 E=13021867.3 (MI South ift)
Elevation: 846.9 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Grouted borehole with cement bentonite slurry, patched pavement with coldpatch.

Date Begin: 02/16/2023 Date End: 02/16/2023

Tooling	Type	Dia.	Groundwater, ft.	
Casing	HSA	4 1/4"	During	None
Sampler	SPT	2"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer	Auto			

Depth Drilled: 25.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Penetration (Blows Per 6") ASTM D 1586	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
845.9	1	S-1	1.5	14-8-5 N=13		8" HMA (0.7)				Fill: 0' to 3.0'
844.9	2					6" Gravel Base (1.2)				
843.9	3				SP-SM	Brown poorly graded SAND with silt; mostly medium to fine sand, few silty fines, few fine gravel, moist, Fill with occasional asphalt fragments (3.0)				
842.9	4	S-2	1.5	5-5-6 N=11			3.0			
841.9	5					Brown lean CLAY; mostly clayey fines, few coarse to fine sand, few fine gravel, moist				
840.9	6									
839.9	7	S-3	1.5	2-3-4 N=7	CL	Grades without fine gravel	1.0			
838.9	8									
837.9	9	S-4	1.5	3-4-7 N=11			1.75			
836.9	10					(10.5)				
835.9	11									
834.9	12	S-5	1.5	6-8-9 N=17	SM	Gray silty SAND; mostly fine sand, some silty fines, moist with occasional clay seams and occasional silt lenses (13.0)				
833.9	13									
832.9	14	S-6	1.5	5-5-6 N=11		Gray lean CLAY; mostly clayey fines, trace coarse to fine sand, moist	2.25			
831.9	15									
830.9	16									
829.9	17	S-7	1.5	3-4-6 N=10		Grades with occasional black seams	1.75			S-7, S-8: Faint organic odor
828.9	18									
827.9	19	S-8	1.5	3-3-5 N=8	CL		1.0			
826.9	20									
825.9	21									
824.9	22	S-9	1.5	4-6-6 N=12		Grades without black seams	1.25			
823.9	23									
822.9	24	S-10	1.5	5-5-6 N=11			1.5			
821.9	25					(25.0)				
						End of Boring				

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 221659
Boring No.: B-10
Sheet: 1 of 1

Project: Grand Ledge Well 2 Raw Watermain Construction
Client: Fishbeck
Location: Grand Ledge, Michigan
Drill Type: Geoprobe 7822
Crew Chief: MDS Field Eng.: JV Rev. By: CK
Coordinates: N=453013.4 E=13021803.4 (MI South ift)
Elevation: 853.0 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Grouted borehole with cement bentonite slurry, patched pavement with coldpatch.

Date Begin: 03/02/2023 Date End: 03/02/2023

Tooling	Type	Dia.	Groundwater, ft.	
Casing	HSA	4 1/4"	During	None
Sampler	SPT	2"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer	Auto			

Depth Drilled: 25.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Penetration (Blows Per 6") ASTM D 1586	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
852.0	1					2 1/2" HMA 0.2				
						6" Gravel Base 0.7				
851.0	2	S-1	1.4	2-3-3 N=6	CL	Brown lean CLAY with sand; mostly clayey fines, little medium to fine sand, trace fine gravel, moist	3.5			
850.0	3									
849.0	4	S-2	1.5	2-3-4 N=7			3.25			
848.0	5									
847.0	6					5.5				
846.0	7	S-3	1.5	6-10-12 N=22	CL	Brown lean CLAY; mostly clayey fines, few medium to fine sand, trace fine gravel, moist	4.5+			
845.0	8									
844.0	9	S-4	1.5	5-8-21 N=29			4.5+			
843.0	10									
842.0	11									
841.0	12	S-5	1.5	6-6-8 N=14		Grades with sand lenses	2.75			
840.0	13									
839.0	14	S-6	1.5	6-8-11 N=19		Grades gray with sand lenses	4.5+			
838.0	15					14.9				
837.0	16	S-7	1.5	9-11-13 N=24	SP-SM	Brown poorly graded SAND with silt; mostly medium to fine sand, few silty fines, moist				
836.0	17									
835.0	18					19.5				
834.0	19	S-8	1.5	6-7-8 N=15	CL	Gray lean CLAY; mostly clayey fines, few medium to fine sand, trace fine gravel, moist	4.5+			
833.0	20									
832.0	21	S-9	1.5	6-8-11 N=19			3.5			
831.0	22									
830.0	23					23.0				
829.0	24	S-10	1.5	11-14-15 N=29	SP-SM	Light brown poorly graded SAND with silt; mostly medium to fine sand, few silty fines, moist				
828.0	25					25.0				
						End of Boring				

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 221659
Boring No.: B-11
Sheet: 1 of 1

Project: Grand Ledge Well 2 Raw Watermain Construction
Client: Fishbeck
Location: Grand Ledge, Michigan
Drill Type: Geoprobe 7822
Crew Chief: MDS Field Eng.: JV Rev. By: CK
Coordinates: N=452544.5 E=13021867.1 (MI South ift)
Elevation: 852.2 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Grouted borehole with cement bentonite slurry.

Date Begin: 03/02/2023 Date End: 03/02/2023

Tooling	Type	Dia.	Groundwater, ft.	
Casing	HSA	4 1/4"	During	None
Sampler	SPT	2"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer	Auto			

Depth Drilled: 25.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Penetration (Blows Per 6") ASTM D 1586	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
851.2	1	S-1	1.3	2-3-5 N=8	SP-SM	3" Sandy Topsoil 0.3 Brown poorly graded SAND with silt; mostly coarse to fine sand, few silty fines, few coarse to fine gravel, moist, Fill 3.0				Fill: 0' to 3.0'
850.2	2									
849.2	3									
848.2	4	S-2	1.5	4-5-6 N=11	CL	Brown lean CLAY; mostly clayey fines, few fine sand, trace fine gravel, moist	2.5			
847.2	5									
846.2	6									
845.2	7	S-3	1.5	3-4-6 N=10			3.25			
844.2	8									
843.2	9	S-4	1.5	6-5-7 N=12			3.5			
842.2	10									
841.2	11									
840.2	12	S-5	1.0	7-7-5 N=12		Grades gray	1.75			S-5, S-8, S-9: Poor recovery; possible coarse gravel / COBBLE
839.2	13									
838.2	14	S-6	1.5	3-3-4 N=7			2.25			
837.2	15									
836.2	16									
835.2	17	S-7	1.5	10-17-22 N=39		17.0				
834.2	18				SP-SM	Light brown poorly graded SAND with silt; mostly medium to fine sand, few silty fines, moist				
833.2	19									
832.2	20	S-8	1.1	7-12-17 N=29						
831.2	21									
830.2	22	S-9	1.0	11-12-15 N=27						
829.2	23									
828.2	24									
827.2	25	S-10	1.5	10-12-15 N=27		25.0				
						End of Boring				

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 221659
Boring No.: B-12
Sheet: 1 of 1

Project: Grand Ledge Well 2 Raw Watermain Construction
Client: Fishbeck
Location: Grand Ledge, Michigan
Drill Type: Geoprobe 7822
Crew Chief: MDS Field Eng.: JV Rev. By: CK
Coordinates: N=452378.0 E=13021837.1 (MI South ift)
Elevation: 848.7 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Grouted borehole with cement bentonite slurry.

Date Begin: 03/03/2023 Date End: 03/03/2023

Tooling	Type	Dia.	Groundwater, ft.	
Casing	HSA	4 1/4"	During	None
Sampler	SPT	2"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer	Auto			

Depth Drilled: 25.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Penetration (Blows Per 6") ASTM D 1586	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
847.7	1	S-1	1.3	2-3-4 N=7		5" Silty Topsoil (0.4)				Fill: 0' to 2.5'
846.7	2				SP-SM	4" Clayey Topsoil (0.8)				
845.7	3					Light brown poorly graded SAND with silt; mostly medium to fine sand, few silty fines, moist (2.5)				
844.7	4	S-2	1.5	4-5-8 N=13			3.25			
843.7	5				CL	Brown lean CLAY; mostly clayey fines, few medium to fine sand, trace fine gravel, moist				
842.7	6									
841.7	7	S-3	0.3	4-6-4 N=10						S-3, S-8, S-10: Poor recovery; possible coarse gravel / COBBLE
840.7	8					(8.0)				
839.7	9	S-4	1.5	2-2-3 N=5		Gray lean CLAY with sand; mostly clayey fines, little medium to fine sand, trace fine gravel, moist	1.0			
838.7	10									
837.7	11									
836.7	12	S-5	1.5	6-4-4 N=8	CL		1.5			
835.7	13									
834.7	14	S-6	1.5	5-5-6 N=11			2.0			
833.7	15									
832.7	16									
831.7	17	S-7	1.5	12-13-15 N=28		(16.5)				
830.7	18					Light brown poorly graded SAND with silt; mostly coarse to fine sand, few silty fines, trace coarse to fine gravel, moist				
829.7	19									
828.7	20	S-8	1.0	9-10-15 N=25	SP-SM					
827.7	21									
826.7	22	S-9	1.3	10-3-15 N=18						
825.7	23									
824.7	24									
823.7	25	S-10	1.2	8-11-15 N=26		(25.0)				
						End of Boring				

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 221659
Boring No.: B-13
Sheet: 1 of 1

Project: Grand Ledge Well 2 Raw Watermain Construction
Client: Fishbeck
Location: Grand Ledge, Michigan
Drill Type: Geoprobe 7822
Crew Chief: MDS Field Eng.: JV Rev. By: CK
Coordinates: N=452338.0 E=13021348.5 (MI South ift)
Elevation: 840.8 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Grouted borehole with cement bentonite slurry.

Date Begin: 03/03/2023 Date End: 03/03/2023

Tooling	Type	Dia.	Groundwater, ft.	
Casing	HSA	4 1/4"	During	12.3
Sampler	SPT	2"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer	Auto			

Depth Drilled: 15.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Penetration (Blows Per 6") ASTM D 1586	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
839.8	1	S-1	1.2	WOH-2-2 N=4		8" Clayey Topsoil 0.7				WOH: Weight of Hammer
838.8	2				SC	Gray clayey SAND; mostly medium to fine sand, some clayey fines, moist 2.5				S-1: Poor recovery; possible coarse gravel / COBBLE
837.8	3									
836.8	4	S-2	1.5	11-12-14 N=26	CL	Brown gray lean CLAY; mostly clayey fines, few medium to fine sand, trace fine sand, moist with occasional rock fragments	4.5+			
835.8	5									
834.8	6									
833.8	7	S-3	1.5	5-5-3 N=8		7.2	4.5+			
832.8	8				SP-SM	Brown poorly graded SAND with silt; mostly coarse to fine sand, few silty fines, moist 9.0				
831.8	9	S-4	1.5	1-2-3 N=5	CL	Gray lean CLAY; mostly clayey fines, moist 12.0	1.75			
830.8	10									
829.8	11									
828.8	12	S-5	1.5	2-7-9 N=16						
827.8	13				SP-SM	Brown poorly graded SAND with silt; mostly medium to fine sand, few silty fines, wet 15.0				
826.8	14	S-6	1.5	3-3-4 N=7						
825.8	15					End of Boring				

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 221659
Boring No.: B-14
Sheet: 1 of 1

Project: Grand Ledge Well 2 Raw Watermain Construction
Client: Fishbeck
Location: Grand Ledge, Michigan
Drill Type: Geoprobe 7822
Crew Chief: MDS Field Eng.: JV Rev. By: CK
Coordinates: N=452064.3 E=13021386.6 (MI South ift)
Elevation: 846.3 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Grouted borehole with cement bentonite slurry.

Date Begin: 03/03/2023 Date End: 03/03/2023

Tooling	Type	Dia.	Groundwater, ft.	
Casing	HSA	4 1/4"	During	None
Sampler	SPT	2"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer	Auto			

Depth Drilled: 15.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Penetration (Blows Per 6") ASTM D 1586	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
845.3	1	S-1	1.5	2-3-6 N=9		6" Silty Topsoil 0.5				Fill: 0' to 2.5'
844.3	2				SP-SM	Brown poorly graded SAND with silt; mostly medium to fine sand, few silty fines, moist 2.5				
843.3	3									
842.3	4	S-2	1.5	1-2-2 N=4	CL	Brown sandy lean CLAY; mostly clayey fines, some medium to fine sand, moist 5.5	0.75			
841.3	5									
840.3	6									
839.3	7	S-3	1.5	9-9-9 N=18		Gray clayey SAND; mostly medium to fine sand, some clayey fines, trace coarse to fine gravel, moist				
838.3	8									
837.3	9	S-4	1.5	6-8-12 N=20	SC					
836.3	10									
835.3	11									
834.3	12	S-5	1.5	7-7-5 N=12		13.0				
833.3	13									
832.3	14	S-6	1.5	5-5-8 N=13	CL	Gray lean CLAY; mostly clayey fines, few medium to fine sand, trace fine gravel, moist 15.0	4.5+			
831.3	15									
						End of Boring				

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

END OF SECTION 00 31 32

SECTION 00 41 43 - BID - UNIT PRICE

Bid of E.T. MacKenzie Company hereinafter called Bidder, organized and existing under the laws of or a resident of the State of Michigan, doing business as a corporation.*

*Insert as applicable: "a corporation", "a partnership" or "an individual".

To the City of Grand Ledge, hereinafter called Owner.

ARTICLE 1 – BID RECIPIENT

1.01 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2 – BIDDER'S ACKNOWLEDGEMENTS

2.01 Bidder accepts all of the terms and conditions of the Advertisement for Bids and Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for 120 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

ARTICLE 3 – BIDDER'S REPRESENTATIONS

3.01 In submitting this Bid, Bidder represents that:

A. Bidder has examined and carefully studied the Bidding Documents, other related data identified in the Bidding Documents, and the following Addenda, receipt of all which is hereby acknowledged:

Addendum Number	Addendum Date
#1	6-6-23

B. Bidder has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

C. Bidder is familiar with and is satisfied as to Laws and Regulations that may affect cost, progress, and performance of the Work.

D. Bidder has carefully studied all:

(1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) that have been identified in the Supplementary Conditions as provided in paragraph 5.03 of the General Conditions, as containing reliable "technical data," and

(2) reports and drawings of Hazardous Environmental Conditions, if any, at the Site that have been identified in the Supplementary Conditions as provided in paragraph 5.06 of the General Conditions as containing reliable "technical data."

E. Bidder has considered the information known to Bidder; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on:

(1) the cost, progress, and performance of the Work;

(2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying the specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents; and

(3) Bidder's safety precautions and programs.

F. Based on the information and observations referred to in Paragraph 3.01.E above, Bidder does not consider that further examinations, investigations, explorations, tests, studies or data are necessary for the determination of this Bid for performance of the Work at the price(s) bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents.

G. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.

H. Bidder has given Engineer written notice of all conflicts, errors, ambiguities or discrepancies that Bidder has discovered in the Bidding Documents, and the written resolution thereof by Engineer is acceptable to Bidder.

I. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work for which this Bid is submitted.

ARTICLE 4 – BIDDER'S CERTIFICATION

4.01 Bidder certifies that:

A. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization or corporation;

B. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid;

C. Bidder has not solicited or induced any individual or entity to refrain from bidding; and

D. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 4.01.D:

(1) "corrupt practice" means the offering, giving, receiving, or soliciting of any thing of value likely to influence the action of a public official in the bidding process;

(2) "fraudulent practice" means an intentional misrepresentation of facts made

(a) to influence the bidding process to the detriment of Owner,

(b) to establish bid prices at artificial non-competitive levels, or

(c) to deprive Owner of the benefits of free and open competition;

(3) "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which to establish bid prices at artificial non-competitive levels; and

(4) "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

ARTICLE 5 – BASIS OF BID

5.01 Bidder will complete the Work in accordance with the Contract Documents for the following unit prices:

Unit Bid Price Schedule					
Item No.	Item Description	Unit	Total Estimated Quantity	Unit Price	Bid Price
1	Cash Allowances - Testing	Dollars	40,000	$1.00	$40,000
2	Mobilization (5% Maximum of Total Bid)	LS	1	70,000	70,000
3	Maintaining Traffic	LS	1	45,000	45,000
4	Preconstruction Video Documentation	LS	1	2,500	2,500
5	Grading, Roadway	Sta	9	4,300	38,700
6	Remove Concrete Curb and Gutter	LF	800	10.60	8,480
7	Remove Concrete Sidewalk and Drive Approaches	SYD	375	28.00	10,500
8	Remove Pavement, Full Depth	SYD	1850	9.30	17,205
9	Remove Sewer Manhole, Valve Chamber or Catch Basin	EA	1	768	768
10	Remove Tree, 6-inch to 18-inch Diameter	EA	2	1,555	3,110
11	Clearing	LS	1	2,567	2,567
12	Remove, Salvage and Reinstall Sign	EA	2	1,415	2,830
13	Soil Erosion and Sedimentation Control	LS	1	49,100	49,100
14	Aggregate Base, 8-inch	SYD	2050	18.50	37,925
15	Curb and Gutter, Concrete	LF	800	63.00	50,400
16	Driveway Approach, HMA	Ton	65	558	36,270
17	Driveway Approach, Concrete, 6 inch	SFT	450	23.15	10,417.50
18	Pavement, HMA 3C	Ton	320	183.15	58,608
19	Pavement, HMA 4C	Ton	160	228.95	36,632
20	Restoration, Lawn	SYD	8500	13.45	114,325
21	Sidewalk Ramp, Concrete, ADA	SFT	120	48.00	5,760
22	Sidewalk, Concrete, 4-inch	SFT	1575	14.45	22,758.75
23	Sidewalk, Concrete, 6-inch	SFT	1350	17.40	23,490
24	Subbase	CYD	700	29.80	20,860
25	Tree, (Ulmus 'New Horizon'), 3-inch	EA	2	3,160	6,320
26	Pavement Markings	LS	1	1,600	1,600
27	Casting, Manhole, Adjust	EA	6	1,390	8,340
28	Casting, Valve Box, Adjust	EA	2	1,286	2,572
29	Valve and Box, Gate, 8-inch	EA	2	4,370	8,740
30	Water Main Fitting, 8-inch, DI	EA	8	914	7,312

Unit Prices have been computed in accordance with Paragraph 13.03 of the General Conditions.

Bidder acknowledges that estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all unit price Bid items will be based on actual quantities, determined as provided in the Contract Documents.

E. T. Mackenzie Company

Bidder (Firm or Corporation Name)

Unit Bid Price Schedule					
Item No.	Item Description	Unit	Total Estimated Quantity	Unit Price	Bid Price
31	Water Main Fitting, 8-inch, HDPE	EA	26	3,293	85,618
32	Water Main Fitting HDPE to DI Transition	EA	2	3,345	6,690
33	Water Main, 8-inch, DI CL 52	LF	60	525	31,500
34	Water Main, 8-inch, HDPE, DIPS, DR 11, Open Cut	LF	2040	319	650,760
35	Water Main, 8-inch, HDPE, DIPS, DR 11, HDD	LF	3520	243	855,360
36	Combination Valve and Chamber	EA	3	42,210	126,630
37	Catch Basin, 4-foot diameter	EA	1	4,500	4,500
38	Storm Sewer, 12-inch, C-76, CL IV	LF	10	710	7,100
39	Cash Allowance - Well 2 Electrical Improvements	Dollars	60,000	$1.00	$60,000
40	Settlement Monitoring	LS	1	31,000	31,000
	TOTAL OF ALL BID PRICES				2,602,248.25

Bid Alternate Items:

Unit Bid Price Schedule					
Item No.	Item Description	Unit	Total Estimated Quantity	Unit Price	Bid Price
Alt-1	Water Main, 8-inch, DI CL 52, HDD	LF	592	464	274,688
Alt-2	Water Main, 8-inch, DI CL 52, NBR Gasket	LF	70	549	38,430
Alt-3	Water Main Fitting, 8-inch, DI, NBR Gasket	EA	4	1,178	4,712
Alt-4	Environmental Monitoring and PPE	LS	1	1,467	1,467
Alt-5	Non-Hazardous Potentially Contaminated Soil Handling and Disposal	CYD	150	155	23,250
Alt-6	Valve and Box, Gate, 12-inch	EA	2	7027	14,054
Alt-7	Water Main Fitting, 12-inch, DI	EA	8	2,557	20,456
Alt-8	Water Main Fitting, 12-inch, HDPE	EA	26	3,443	89,518
Alt-9	Water Main Fitting HDPE to DI Transition, 12-inch	EA	2	7,948	15,896
Alt-10	Water Main, 12-inch, HDPE, DIPS, DR 11, Open Cut	LF	2040	339	689,520.00
Alt-11	Water Main, 12-inch, HDPE, DIPS, DR 11, HDD	LF	3520	300	1,056,000
Alt-12	Combination Valve and Chamber, 12-inch Pipe	EA	3	62,000	186,000
Alt-13	Water Main, 12-inch, DI CL 52, HDD	LF	592	651	385,392
Alt-14	Water Main, 12-inch, DI CL 52, NBR Gasket	LF	70	590	41,300
Alt-15	Water Main Fitting, 12-inch, DI, NBR Gasket	EA	4	1,935	7,740
	TOTAL OF ALL ALTERNATE BID PRICES				

2,848,423.00

Unit Prices have been computed in accordance with Paragraph 13.03 of the General Conditions.

Bidder acknowledges that estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all unit price Bid items will be based on actual quantities, determined as provided in the Contract Documents.

E. T. MacKenzie Company

Bidder (Firm or Corporation Name)

ARTICLE 6 – TIME OF COMPLETION

6.01 Bidder agrees that the Work will be substantially complete no later than October 18, 2024 and completed and ready for final payment in accordance with paragraph 15.06 of the General Conditions on or before November 1, 2024

6.02 Bidder agrees that the Work will be substantially complete within 105 calendar days once work begins on site.

6.03 Bidder agrees that work will not take place during specified events as outlined in the Summary of Work.

6.04 Bidder accepts the provisions of the Agreement as to liquidated damages.

6.05 Bidder acknowledges that the Work will not begin until the Funding Agency contracting requirements have been met and a contract is executed. It is anticipated that this will occur on August 28, 2023, but subject to change as determined by the Funding Agency.

ARTICLE 7 – ATTACHMENTS TO THIS BID

7.01 The following documents are submitted with and made a condition of this Bid:

A. Required Bid security.

B. Evidence of authority to sign Bid, if Bid is submitted by a corporation, partnership or joint venture;

C. Certification Regarding Debarment, Suspension, and Other Responsibility Matters.

ARTICLE 8 – DEFINED TERMS

8.01 The terms used in this Bid with initial capital letters have the meanings indicated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

ARTICLE 9 – BID SUBMITTAL

9.01 This Bid is submitted by:

SUBMITTED on June 22, 2023
Date*

4243 W Saginaw Hwy
Business Street Address*

Grand Ledge MI 48837
City, State, and Zip*

517-627-8408
Telephone Number*

517-627-4470
Facsimile Number*

mmarks@mackenziecc.com
E-mail Address*

BY: C. T. MacKenzie Company
Name of Bidder*

Signature

Michael S. Marks, President
Name and Title of Signatory*

*Typed or printed in ink.

END OF SECTION 00 41 43

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Liberty Mutual Surety
Attention: LMS Claims
PO Box 34526
Seattle, WA 98124
Phone: (206) 473-6210
Fax: (866) 548-6873
Email: HOSCL@libertymutual.com
www.LibertyMutualSuretyClaims.com

Liberty Mutual Insurance Company

BID OR PROPOSAL BOND

KNOW ALL MEN BY THESE PRESENTS, That we, E T MacKenzie Company of 4248 W. Saginaw Hwy Grand Ledge MI 48837 (hereinafter called the Principal) as Principal, and Liberty Mutual Insurance Company, with its principal office in the City of Boston, MA (hereinafter called the Surety), as Surety, are held and firmly bound unto City of Grand Ledge, 310 Greenwood St, Grand Ledge, MI 48837 (hereinafter called the Obligee) in the penal sum of Five Percent of Bid Dollars (5% of Bid) lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors and assigns.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas, the Principal has submitted the accompanying bid dated 6/15/2023 for Well 2 Raw Water Main, Eaton County, MI .

NOW, THEREFORE, if the Obligee shall make any award according to the terms of said bid and the Principal shall enter into a contract with said Obligee in accordance with the terms of said bid and give bond for the faithful performance thereof within the time specified; or if no time is specified within thirty days after the date of said award; or if the Principal shall, in the case of failure so to do, indemnify the Obligee against any loss the Obligee may suffer directly arising by reason of such failure, not exceeding the penalty of this bond, then this obligation shall be null and void; otherwise to remain in full force and virtue.

Signed, sealed and dated: 6/15/2023

E T MacKenzie Company
Principal

By: _____
Michael S. Marks, President

LIBERTY MUTUAL INSURANCE COMPANY INCORPORATED 1912 MASSACHUSETTS

Liberty Mutual Insurance Company

By: _____
Robert G Chapman (Attorney-in-fact)

S-137-Rev.

LMS-20865 11/17

E. T. MacKenzie Company Minutes of the Special
Meeting of the Board of Directors

The Special Meeting of the Directors of E. T. MacKenzie Company was held at the corporate office of the corporation at 4248 W. Saginaw Hwy in the Township of Oneida, County of Eaton, State of Michigan, on December 21, 2015, at 11:30 a.m., pursuant to a written waiver of notice of such meeting signed by the Corporate Secretary affixing the time, date, and place of said meeting.

Michael S. Marks, Thomas E. MacKenzie, and Stephanie MacKenzie, the directors and shareholders of the corporation, were present. Upon motion duly made, seconded and carried, the following resolution was adopted:

> RESOLVED, that Michael S. Marks, President, Thomas E. MacKenzie, Vice-President, and Stephanie MacKenzie, Secretary, of the corporation, are hereby authorized for and on behalf of said corporation to act for the business in all matters connected with its contracting business and to sign all contract related documents, including bids, bid bonds, contracts and contract change orders.

There being no further business to be transacted, the meeting was, upon motion duly made, seconded and carried, adjourned.

Dated: December 21, 2015

Stephanie MacKenzie,
Director, Shareholder, and Secretary
of the Meeting

Certification Regarding
Debarment, Suspension, and Other Responsibility Matters

The prospective participant certifies, to the best of its knowledge and belief, that it and its principals:

(1) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in transactions under federal nonprocurement programs by any federal department or agency;

(2) Have not, within the three year period preceding the proposal, had one or more public transactions (federal, state, or local) terminated for cause or default; and

(3) Are not presently indicted or otherwise criminally or civilly charged by a government entity (federal, state, or local) and have not, within the three year period preceding the proposal, been convicted of or had a civil judgment rendered against it:

(a) For the commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public transaction (federal, state, or local) or a procurement contract under such a public transaction;

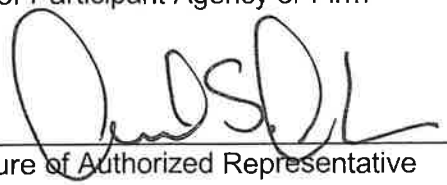
(b) For the violation of federal or state antitrust statutes, including those proscribing price fixing between competitors, the allocation of customers between competitors, or bid rigging; or

(c) For the commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property.

I understand that a false statement on this certification may be grounds for the rejection of this proposal or the termination of the award. In addition, under 18 U.S.C. §1001, a false statement may result in a fine of up to $10,000 or imprisonment for up to five years, or both.

Michael S Marks, President
Name and Title of Authorized Representative

E. T. Mackenzie Company
Name of Participant Agency or Firm



Signature of Authorized Representative

6/22/23
Date

☐ I am unable to certify to the above statement. Attached is my explanation.

A RESOLUTION TO TENTATIVELY AWARD
A CONSTRUCTION CONTRACT FOR WATER SYSTEM IMPROVEMENTS

WHEREAS, the City of Grand Ledge *(legal name of applicant)* wishes to construct a new twelve-inch raw water main from Well No. 2 in Jaycee Park to the Iron Removal Plant; and

WHEREAS, the water system improvements project formally adopted by EGLE on November 16, 2022, *(date of final project plan adoption)* will be funded through the state of Michigan's Drinking Water State Revolving Fund (DWSRF) program; and

WHEREAS, the City of Grand Ledge *(legal name of applicant)* has sought and received construction bids for the proposed improvements and has received a low bid in the amount of $2,945,974.25 from E.T. MacKenzie Company *(name of the contractor)*; and

WHEREAS, the City's engineer, Fishbeck has recommended awarding the contract to the low bidder.

NOW THEREFORE BE IT RESOLVED, that the City of Grand Ledge *(legal name of applicant)* tentatively awards the contract for construction of the proposed water system improvements project to E.T. MacKenzie Company *(name of the contractor)*, contingent upon successful financial arrangements with the DWSRF.

Yeas:	Gillespie, Jancek, Lantz, Logel, MacDowell, Mulder, Willems
Nays:	none
Abstain:	none
Absent:	none

I certify that the above Resolution was adopted by the City of Grand Ledge *(the governing body of the applicant)* on July 10, 2023.

BY: Gregory L. Newman, City Clerk
Name and Title *(please print or type)*

07/11/2023
01:35 PM EDT

Signature Date

12-inch Option Bid Tabulation

Project Name: Grand Ledge Raw Water Main Well 2
Project Location: Grand Ledge Michigan
Project Number: 221916
Bid Opening Date: Thursday, June 22, 2023
Time: 10:00 a.m.
Estimate By: Michael Berrevoets

				ENGINEER'S ESTIMATE		Apparent Low Bid E.T. MacKenzie Company	
Item No.	Item Description	Unit	Est Quantity	Unit Price	Amount	Unit Price	Amount
1	Cash Allowances - Testing	Dollars	40,000	$1.00	$40,000.00	$1.00	$40,000.00
2	Mobilization (5% Maximum of Total Bid)	LS	1	$83,000.00	$83,000.00	$70,000.00	$70,000.00
3	Maintaining Traffic	LS	1	$60,000.00	$60,000.00	$45,000.00	$45,000.00
4	Preconstruction Video Documentation	LS	1	$10,000.00	$10,000.00	$2,500.00	$2,500.00
5	Grading, Roadway	STA	9	$7,500.00	$67,500.00	$4,300.00	$38,700.00
6	Remove Concrete Curb and Gutter	LF	800	$15.00	$12,000.00	$10.60	$8,480.00
7	Remove Concrete Sidewalk and Drive Approaches	SYD	375	$12.00	$4,500.00	$28.00	$10,500.00
8	Remove Pavement, Full Depth	SYD	1850	$10.00	$18,500.00	$9.30	$17,205.00
9	Remove Sewer Manhole, Valve Chamber or Catch Basin	EA	1	$2,000.00	$2,000.00	$768.00	$768.00
10	Remove Tree, 6-inch to 18-inch Diameter	EA	2	$1,200.00	$2,400.00	$1,555.00	$3,110.00
11	Clearing	LS	1	$5,000.00	$5,000.00	$2,567.00	$2,567.00
12	Remove, Salvage and Reinstall Sign	EA	2	$450.00	$900.00	$1,415.00	$2,830.00
13	Soil Erosion and Sedimentation Control	LS	1	$35,000.00	$35,000.00	$49,100.00	$49,100.00
14	Aggregate Base, 8-inch	SYD	2050	$25.00	$51,250.00	$18.50	$37,925.00
15	Curb and Gutter, Concrete	LF	800	$30.00	$24,000.00	$63.00	$50,400.00
16	Driveway Approach, HMA	TON	65	$150.00	$9,750.00	$558.00	$36,270.00
17	Driveway Approach, Concrete, 6 inch	SFT	450	$9.50	$4,275.00	$23.15	$10,417.50
18	Pavement, HMA 3C	TON	320	$125.00	$40,000.00	$183.15	$58,608.00
19	Pavement, HMA 4C	TON	160	$135.00	$21,600.00	$228.95	$36,632.00
20	Restoration, Lawn	SYD	8500	$6.00	$51,000.00	$13.45	$114,325.00
21	Sidewalk Ramp, Concrete, ADA	SFT	120	$75.00	$9,000.00	$48.00	$5,760.00
22	Sidewalk, Concrete, 4-inch	SFT	1575	$6.50	$10,237.50	$14.45	$22,758.75
23	Sidewalk, Concrete, 6-inch	SFT	1350	$8.00	$10,800.00	$17.40	$23,490.00
24	Subbase	CYD	700	$30.00	$21,000.00	$29.80	$20,860.00
25	Tree, (Ulmus 'New Horizon'), 3-inch	EA	2	$800.00	$1,600.00	$3,160.00	$6,320.00
26	Pavement Markings	LS	1	$3,500.00	$3,500.00	$1,600.00	$1,600.00
27	Casting, Manhole, Adjust	EA	6	$750.00	$4,500.00	$1,390.00	$8,340.00
28	Casting, Valve Box, Adjust	EA	2	$400.00	$800.00	$1,286.00	$2,572.00
29	Valve and Box, Gate, 8-inch	EA	**0**	$3,200.00	$0.00	$4,370.00	$0.00
30	Water Main Fitting, 8-inch, DI	EA	**6**	$1,300.00	$7,800.00	$914.00	$5,484.00
31	Water Main Fitting, 8-inch, HDPE	EA	**0**	$900.00	$0.00	$3,293.00	$0.00
32	Water Main Fitting HDPE to DI Transition	EA	**0**	$3,200.00	$0.00	$3,345.00	$0.00
33	Water Main, 8-inch, DI CL 52	LF	60	$225.00	$13,500.00	$525.00	$31,500.00
34	Water Main, 8-inch, HDPE, DIPS, DR 11, Open Cut	LF	**0**	$145.00	$0.00	$319.00	$0.00
35	Water Main, 8-inch, HDPE, DIPS, DR 11, HDD	LF	**0**	$165.00	$0.00	$243.00	$0.00
36	Combination Valve and Chamber	EA	**0**	$30,000.00	$0.00	$42,210.00	$0.00
37	Catch Basin, 4-foot diameter	EA	1	$3,500.00	$3,500.00	$4,500.00	$4,500.00
38	Storm Sewer, 12-inch, C-76, CL IV	LF	10	$150.00	$1,500.00	$710.00	$7,100.00
39	Cash Allowance - Well 2 Electrical Improvements	DOLLARS	60,000	$1.00	$60,000.00	$1.00	$60,000.00
40	Settlement Monitoring	LS	1	$60,000.00	$60,000.00	$31,000.00	$31,000.00
	Construction Cost Subtotal (calculated)				**$750,412.50**		**$866,622.25**

Bid Alternate Items				ENGINEER'S ESTIMATE		E.T. MacKenzie Company	
Item No.	Item Description	Unit	Quantity	Unit Price	Amount	Unit Price	Amount
Alt-1	Water Main, 8-inch, DI CL 52, HDD	LF	0	$245.00	$0.00	$464.00	$0.00
Alt-2	Water Main, 8-inch, DI CL 52, NBR Gasket	LF	0	$250.00	$0.00	$549.00	$0.00
Alt-3	Water Main Fitting, 8-inch, DI, NBR Gasket	EA	0	$1,600.00	$0.00	$1,170.00	$0.00
Alt-4	Environmental Monitoring and PPE	LS	0	$15,000.00	$0.00	$1,467.00	$0.00
Alt-5	Non-Hazardous Potentially Contaminated Soil Handling and Disposal	CYD	150	$150.00	$22,500.00	$155.00	$23,250.00
Alt-6	Valve and Box, Gate, 12-inch	EA	2	$5,500.00	$11,000.00	$7,027.00	$14,054.00
Alt-7	Water Main Fitting, 12-inch, DI	EA	**2**	$1,600.00	$3,200.00	$2,557.00	$5,114.00
Alt-8	Water Main Fitting, 12-inch, HDPE	EA	26	$1,200.00	$31,200.00	$3,443.00	$89,518.00
Alt-9	Water Main Fitting HDPE to DI Transition, 12-inch	EA	2	$4,000.00	$8,000.00	$7,948.00	$15,896.00
Alt-10	Water Main, 12-inch, HDPE, DIPS, DR 11, Open Cut	LF	2040	$180.00	$367,200.00	$338.00	$689,520.00
Alt-11	Water Main, 12-inch, HDPE, DIPS, DR 11, HDD	LF	3520	$200.00	$704,000.00	$300.00	$1,056,000.00
Alt-12	Combination Valve and Chamber, 12-inch Pipe	EA	3	$40,000.00	$120,000.00	$62,000.00	$186,000.00
Alt-13	Water Main, 12-inch, DI CL 52, HDD	LF	0	$285.00	$0.00	$651.00	$0.00
Alt-14	Water Main, 12-inch, DI CL 52, NBR Gasket	LF	0	$290.00	$0.00	$590.00	$0.00
Alt-15	Water Main Fitting, 12-inch, DI, NBR Gasket	EA	0	$1,900.00	$0.00	$1,935.00	$0.00
				Subtotal	**$1,267,100.00**	***Subtotal***	**$2,079,352.00**
				Total	**$2,017,512.50**	***Total***	**$2,945,974.25**

SECTION 00 51 00 - NOTICE OF AWARD

Dated September 8, 2023

9/13/23
AFS

TO: E.T. MacKenzie Company (Bidder)

ADDRESS: 4248 W Saginaw Highway
Grand Ledge, MI 48837

CONTRACT: Well 2 Raw Water Main
Grand Ledge, MI
Project No. 221916

You are notified that your Bid dated June 22, 2023 for the above Contract has been considered. You are the Successful Bidder and are awarded a Contract for the Well 2 Raw Water Main project.

The Contract Price of your Contract is Two Million Nine Hundred Forty-Five Thousand Nine Hundred and Seventy-Four Dollars and Twenty-Five Cents ($2,945,974.25). Two copies of the proposed Contract Documents as identified in the Agreement accompany this Notice of Award.

You must comply with the following conditions precedent within 30 days of the date of this Notice of Award, that is by October 6, 2023.

1. Deliver to the Owner two fully executed counterparts of the Contract Documents which accompany this Notice of Award, each of which must bear your signature at the designated location.

2. Deliver with the Executed Contract Documents the Contract security (bonds) as specified in the Instructions to Bidders (Article 20), the General Conditions (Paragraph 6.01), and the Supplementary Conditions (Paragraph SC-6.01).

3. Deliver with the Executed Contract Documents the insurance documents as specified in the General Conditions (Article 6) and the Supplementary Conditions (Article SC-6).

Failure to comply with these conditions within the time specified will entitle Owner to consider you in default, annul this Notice of Award, and declare your Bid security forfeited.

Within 20 days after you comply with the above conditions, Owner will return to you one fully executed counterpart of the Contract Documents.

City of Grand Ledge

By: _____
(Authorized Signature)

Adam Smith, City Manager
(Name and Title)

*Typed or printed in ink

Copy to Engineer

END OF SECTION 00 51 00

SECTION 00 52 00 – AGREEMENT FORM

THIS AGREEMENT is by and between City of Grand Ledge, Michigan ("Owner") and E.T. MacKenzie Company ("Contractor").

Owner and Contractor hereby agree as follows:

ARTICLE 1 - WORK

1.01 Contractor shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as construction of the Well 2 Raw Water Main project.

A. Project includes the following major items:

1. Approximately 5,700 feet of 8-inch HDPE Raw Water Main to be installed utilizing both Horizontal directional drilling and open cut techniques including testing and appurtenances.
2. Connection to the existing Well 2 discharge line.
3. Connection to the existing water treatment plant raw water system.
4. Furnish and install VFD at Well 2
5. Restoration of disturbed areas including bituminous paving, concrete surfacing, and lawn restoration.
6. Temporary maintenance of traffic during construction.

ARTICLE 2 - THE PROJECT

2.01 The Project for which the Work under the Contract Documents may be the whole or only a part is generally described as follows: Well 2 Raw Water Main.

ARTICLE 3 - ENGINEER

3.01 The Project has been designed by Fishbeck, Grand Rapids, Michigan, ("Engineer,") which is to act as Owner's representative, assume all duties and responsibilities, and have the rights and authority assigned to Engineer in the Contract Documents in connection with completion of the Work in accordance with the Contract Documents.

ARTICLE 4 - CONTRACT TIME

4.01 TIME OF THE ESSENCE

A. All time limits for Milestones, if any, Substantial Completion, and completion and readiness for final payment as stated in the Contract Documents are of the essence of the Contract.

4.02 DATES FOR SUBSTANTIAL COMPLETION AND FINAL PAYMENT

A. The Work will be substantially completed on or before October 18, 2024 and completed and ready for final payment in accordance with Paragraph 15.07 of the General Conditions on or before November 1, 2024

B. Work will be completed within 105 consecutive calendar days once work commences.

4.03 LIQUIDATED DAMAGES

A. Contractor and Owner recognize that time is of the essence as stated in Paragraph 4.01 above and that Owner will suffer financial loss if the Work is not completed within the times specified in Paragraph 4.02 above, plus any extensions thereof allowed in accordance with Article 11 of the General Conditions. The parties also recognize the delays, expense and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty) Contractor shall pay Owner One Thousand Five Hundred Dollars ($1,500) for each day that expires after the time specified in Paragraph 4.02 above for Substantial Completion until the Work is substantially complete.

B. After Substantial Completion, if Contractor shall neglect, refuse or fail to complete the remaining Work within the Contract Time or any proper extension thereof granted by Owner, Contractor shall pay Owner one thousand five hundred Dollars ($1,500) for each day that expires after the time specified in Paragraph 4.02 above for completion and readiness for final payment until the Work is completed and ready for final payment.

C. Liquidated damages for failure to meet the specified Substantial Completion date and for failure to meet the specified Final Completion date will not be assessed simultaneously.

ARTICLE 5 - CONTRACT PRICE

5.01 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents, in current funds, a total amount of Two Million Nine Hundred Forty-Five Thousand Nine Hundred and Seventy-Four Dollars and Twenty-Five Cents ($2,945,974.25) at the unit prices stated in Contractor's Bid.

ARTICLE 6 - PAYMENT PROCEDURES

6.01 SUBMITTAL AND PROCESSING OF PAYMENTS

A. Contractor shall submit Applications for Payment in accordance with Article 15 of the General Conditions. Applications for Payment will be processed by Engineer as provided in the General Conditions.

6.02 PROGRESS PAYMENTS; RETAINAGE

A. Owner shall make progress payments on account of the Contract Price on the basis of Contractor's Applications for Payment during performance of the Work as provided in Paragraphs 6.02. A.1 and 6.02.A.2 below. All such payments will be based on unit prices and number of units completed.

1. Prior to Substantial Completion, progress payments will be in an amount equal to: 100% of the Work completed and 100% of materials and equipment not incorporated in the Work but delivered, suitably stored and accompanied by documentation satisfactory to Owner as provided in Paragraph 15.01 of the General Conditions less the aggregate of payments previously made and less such amounts as Engineer may determine, or Owner may withhold, including but not limited to liquidated damages, in accordance with Paragraph 15.01 of the General Conditions, except that Owner will retain a portion of each progress payment limited to:

a. Not more than 10% of the dollar value of the Work completed until 50% of the Work has been completed as determined by Engineer.

b. After the Work has been 50% completed as determined by Engineer, additional retainage will not be withheld unless Owner determines that Contractor is not making satisfactory progress, or for other specific cause relating to Contractor's performance under the Contract. If Owner so determines, Owner may retain not more than 10% of the dollar value of the Work more than 50% completed.

2. Upon Substantial Completion, Owner shall pay an amount sufficient to increase total payments to Contractor to 95% of the Contract Price, less such amounts as Engineer shall determine, or Owner may withhold, in accordance with Paragraph 15.01 B.5 and 15.01 B.6.of the General Conditions.

3. Owner may deduct from progress payments amounts which are due to Owner from Contractor in accordance with the Contract Documents.

4. After Substantial Completion, Owner may, at Owner's sole discretion, pay an amount sufficient to increase total payments to Contractor to more than 95% of the Contract Price if Owner has received consent of surety in a form acceptable to Owner.

5. Progress payments shall not be due until 15 days after Owner has received the funds with which to make the progress payment from a department or agency of the federal or state government, if any funds are to come from either of these sources.

B. The retained funds will not be commingled with other funds of Owner and will be deposited in an interest-bearing account in a regulated financial institution in this state wherein all such retained funds are kept by Owner which will account for both retainage and interest on each construction contract separately.

C. Owner is not required to deposit retained funds in an interest-bearing account if the retained funds are to be provided under a state or federal grant and the retained funds have not been paid to Owner.

D. Owner, at any time after 94% of work under the contract has been completed as determined by Engineer and at the request of Contractor, will release the retainage plus interest to Contractor only if Contractor provides to Owner an irrevocable letter of credit in the amount of the retainage plus interest, issued by a bank authorized to do business in this state, containing terms mutually acceptable to Contractor and Owner.

E. Unresolved disputes between Owner and Contractor regarding retained funds and interest on retained funds shall be submitted to an agent in accordance with the dispute resolution process described in Section 4 of State of Michigan Act 524 of P.A. of 1980.

6.03 FINAL PAYMENT

A. Upon final completion and acceptance of the Work in accordance with Paragraph 15.06 of the General Conditions, Owner shall pay the remainder of the Contract Price as recommended by Engineer as provided in said Paragraph 15.06.

ARTICLE 7 - INTEREST

7.01 All moneys not paid when due as provided in Article 15 of the General Conditions shall bear interest at the rate of 0.25% per month.

ARTICLE 8 - CONTRACTOR'S REPRESENTATIONS

8.01 In order to induce Owner to enter into this Agreement Contractor makes the following representations:

A. Contractor has examined and carefully studied the Contract Documents and the other related data identified in the Bidding Documents.

B. Contractor has visited the Site and become familiar with and is satisfied as to the general, local and Site conditions that may affect cost, progress, and performance of the Work.

C. Contractor is familiar with and is satisfied as to all federal, state and local Laws and Regulations that may affect cost, progress and performance of the Work.

D. Contractor has carefully studied all:

(1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities), if any, that have been identified Paragraph 5.03 of the Supplementary Conditions as provided in Paragraph 5.03 of the General Conditions as containing reliable "technical data," and

(2) reports and drawings of Hazardous Environmental Conditions, if any, at the Site that have been identified in Paragraph 5.06 of the Supplementary Conditions as provided in paragraph 5.06 of the General Conditions as containing reliable "technical data."

E. Contractor has considered the information known to Contractor; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Contract Documents; and the Site-related reports and drawings identified in the Contract Documents, with respect to the effect of such information, observations, and documents on

(1) the cost, progress, and performance of the Work;

(2) the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, including any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Contract Documents; and

(3) Contractor's safety precautions and programs.

F. based on the information and observations referred to in Paragraph 8.01.E above, Contractor does not consider that any further examinations, investigations, explorations, tests, studies or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract Documents.

G. Contractor is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.

H. Contractor has given Engineer written notice of all conflicts, errors, ambiguities or discrepancies that Contractor has discovered in the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.

I. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

ARTICLE 9 - CONTRACT DOCUMENTS

9.01 CONTENTS

A. The Contract Documents consist of the following:
1. Contractor's Bid dated June 22, 2023.
2. Addenda 1 to 1, inclusive.
3. Notice of Award.
4. This Agreement.
5. Performance Bond.
6. Payment Bond.
7. General Conditions.
8. Supplementary Conditions.
9. Specifications as listed in the table of contents of the Project Manual.
10. Drawings, consisting of sheets as listed on the cover sheet with each sheet bearing the following general title: Well 2 Raw Water Main and dated May 15, 2023 (not included in the executed Contract Documents).
12. The following which may be delivered or issued on or after the Effective Date of the Agreement and are not attached hereto:
    a. Work Change Directives;
    b. Change Orders.

B. The documents listed in Paragraph 9.01.A are attached to this Agreement (except as expressly noted otherwise above).

C. There are no Contract Documents other than those listed above in this Article 9.

D. The Contract Documents may only be amended, modified or supplemented as provided in Paragraph 11.01 of the General Conditions.

ARTICLE 10 - MISCELLANEOUS

10.01 TERMS

A. Terms used in this Agreement will have the meanings indicated in the General Conditions and the Supplementary Conditions.

10.02 ASSIGNMENT OF CONTRACT

A. No assignment by a party hereto of any rights under or interests in the Contract will be binding on another party hereto without the written consent of the party sought to be bound; and, specifically but without limitation, moneys that may become due and moneys that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.

10.03 SUCCESSORS AND ASSIGNS

A. Owner and Contractor each binds itself, its partners, successors, assigns and legal representatives to the other party hereto, its partners, successors, assigns and legal representatives in respect to all covenants, agreements and obligations contained in the Contract Documents.

10.04 SEVERABILITY

A. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation shall be deemed stricken, and all remaining provisions shall continue to be valid and binding upon Owner and Contractor, who agree that the Contract Documents shall be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

10.05 CONTRACTOR'S CERTIFICATIONS

A. Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of this Paragraph 10.05:

(1) "corrupt practice" means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process or in the Contract execution;

(2) "fraudulent practice" means an intentional misrepresentation of facts made:

(a) to influence the bidding process or the execution of the Contract to the detriment of Owner,

(b) to establish Bid or Contract prices at artificial non-competitive levels, or

(c) to deprive Owner of the benefits of free and open competition;

(3) "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which to establish Bid prices at artificial non-competitive levels; and

(4) "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement. Counterparts have been delivered to Owner, Contractor and Engineer. All portions of the Contract Documents have been signed or identified by Owner and Contractor or on their behalf.

Contractor:
E.T. MacKenzie Company
Name of Contractor*

By: _____
Signature

Michael S. Marks, President
(Name and Title of Signatory*)

Attest: _____
Ashleigh Bond
(Name and Title of Signatory*)

Signed on: September 25, 2023
(Date*)

Address for giving notices:
4248 W. Saginaw Hwy.
(Street*)
Grand Ledge MI 48837
(City, State and Zip*)

License No. 2104063278 (Where applicable)

Agent for service of process: Michael S. Marks

(If Contractor is a corporation or a partnership, attach evidence of authority to sign.)

Designated Representative:
Phil Parker
(Name*)
Project Manager
(Title*)
4248 W. Saginaw Hwy.
(Street*)
Grand Ledge MI 48837
(City, State and Zip*)
517-627-8408
(Telephone Number*)
517-627-4470
(Facsimile*)

Owner:
City of Grand Ledge

By: _____
Signature

Adam Smith, City Manager
(Name and Title of Signatory*)

Attest: _____
Gregory L Newman
(Name and Title of Signatory*)

Signed on: 05 Oct, 2023
(Effective Date of Agreement*)

Address for giving notices:
310 Greenwood St.
(Street*)
Grand Ledge MI 48837
(City, State and Zip*)

(If Owner is a corporation, attach evidence of authority to sign. If Owner is a public body, attach evidence of authority to sign and resolution or other documents authorizing execution of this Agreement.)

Designated Representative:
Adam Smith
(Name*)
City Manager
(Title*)
310 Greenwood St.
(Street*)
Grand Ledge MI 48837
(City, State and Zip*)
(517) 627 2149
(Telephone Number*)

(Facsimile*)

* Typed or printed in ink.

END OF SECTION 00 52 00

E. T. MacKenzie Company Minutes of the Special
Meeting of the Board of Directors

The Special Meeting of the Directors of E. T. MacKenzie Company was held at the corporate office of the corporation at 4248 W. Saginaw Hwy in the Township of Oneida, County of Eaton, State of Michigan, on December 21, 2015, at 11:30 a.m., pursuant to a written waiver of notice of such meeting signed by the Corporate Secretary affixing the time, date, and place of said meeting.

Michael S. Marks, Thomas E. MacKenzie, and Stephanie MacKenzie, the directors and shareholders of the corporation, were present. Upon motion duly made, seconded and carried, the following resolution was adopted:

> RESOLVED, that Michael S. Marks, President, Thomas E. MacKenzie, Vice-President, and Stephanie MacKenzie, Secretary, of the corporation, are hereby authorized for and on behalf of said corporation to act for the business in all matters connected with its contracting business and to sign all contract related documents, including bids, bid bonds, contracts and contract change orders.

There being no further business to be transacted, the meeting was, upon motion duly made, seconded and carried, adjourned.

Dated: December 21, 2015

Stephanie MacKenzie,
Director, Shareholder, and Secretary
of the Meeting

SECTION 00 55 00 – NOTICE TO PROCEED

Dated 05 Oct, 2023

Contractor: E.T. MacKenzie Company
4248 West Saginaw Highway
Grand Ledge, MI 48837

CONTRACT: Well 2 Raw Water Main
Grand Ledge, MI
Project Number 221916

You are notified that the Contract Times under the above Contract will commence to run on October 5, 2023. By that date, you are to start performing your obligations under the Contract Documents. In accordance with Article 4 of the Agreement the date of Substantial Completion is October 18, 2024, and the date of readiness for final payment is November 1, 2024. Article 4 requires work to be completed within 105 consecutive calendar days once work commences on the project site.

Work includes the 12-inch water main Bid Alternative from Addendum 1.

City of Grand Ledge

By: _____
(Authorized Signature)

Adam Smith, City Manager
(Name and Title)

*Typed or printed in ink

Copy to Engineer

END OF SECTION 00 55 00

SECTION 00 61 14 – PERFORMANCE BOND FORM

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

Contractor (Name and Address):

E T MacKenzie Company
4248 W Saginaw Hwy, Grand Ledge, MI 48837

Surety (Name and Address of Principal Place of Business):

Liberty Mutual Insurance Company
175 Berkeley Street, Boston, MA 02116

Owner

City of Grand Ledge
310 Greenwood Street
Grand Ledge, MI 48837

CONTRACT

Date (Date of Notice of Award): September 13, 2023
Amount: $2,945,974.25

Description: Well 2 Raw Water Main
Grand Ledge, Michigan

BOND

Bond Number: 013131657
Date (Not earlier than Contract Date): September 20, 2023
Amount: $2,945,974.25
Modifications to this Bond form: None

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Performance Bond to be duly executed by an authorized officer, agent, or representative.

Contractor AS PRINCIPAL

E T MacKenzie Company (Seal)
Contractor's Name and Corporate Seal

By: _____
Signature
Michael S. Marks
Print Name
President
Title

Attest: _____
Signature
Project Administrator
Title

SURETY

Liberty Mutual Insurance Company (Seal)
Surety's Name and Corporate Seal

By: _____
Signature (Attach Power of Attorney)
Robert G Chapman
Print Name
Attorney-in-Fact
Title

Attest: _____
Signature
Marcia J Miller
Title

IMPORTANT: Surety companies executing Bonds must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in Michigan. Attach Power of Attorney for those signatures executing for Surety, certifying authority to bind the Surety as of the date of the Bond:

1. Contractor and the Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to Owner for the performance of the Contract, which is incorporated herein by reference.

2. If Contractor performs the Contract, the Surety and Contractor have no obligation under this Bond, except to participate in conferences as provided in paragraph 3.1.

3. If there is no Owner Default, the Surety's obligation under this Bond shall arise after:

3.1. Owner has notified Contractor and Surety at the addresses described in Paragraph 10 below, that Owner is considering declaring a Contractor Default and has requested and attempted to arrange a conference with Contractor and Surety to be held not later than 15 days after receipt of such notice to discuss methods of performing the Contract. If Owner, Contractor and Surety agree, Contractor shall be allowed a reasonable time to perform the Contract, but such an agreement shall not waive Owner's right, if any, subsequently to declare a Contractor Default; and

3.2. Owner has declared a Contractor Default and formally terminated Contractor's right to complete the Contract. Such Contractor Default shall not be declared earlier than 20 days after Contractor and Surety have received notice as provided in paragraph 3.1; and

3.3. Owner has agreed to pay the Balance of the Contract Price to:

3.3.1. Surety in accordance with the terms of the Contract; or

3.3.2. Another contractor selected pursuant to paragraph 4.3 to perform the Contract.

4. When Owner has satisfied the conditions of Paragraph 3, Surety shall promptly and at Surety's expense take one of the following actions:

4.1. Arrange for Contractor, with consent of Owner, to perform and complete the Contract; or

4.2. Undertake to perform and complete the Contract itself, through its agents or through independent contractors; or

4.3. Obtain bids or negotiated proposals from qualified contractors acceptable to Owner for a contract for performance and completion of the Contract, arrange for a contract to be prepared for execution by Owner and contractor selected with Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Contract, and pay to Owner the amount of damages as described in Paragraph 6 in excess of the Balance of the Contract Price incurred by Owner resulting from Contractor Default; or

4.4. Waive its right to perform and complete, arrange for completion, or obtain a new contractor, and with reasonable promptness under the circumstances:

4.4.1. After investigation, determine the amount for which it may be liable to Owner and, as soon as practicable after the amount is determined, tender payment therefor to Owner; or

4.4.2. Deny liability in whole or in part and notify Owner citing reasons therefor.

5. If Surety does not proceed as provided in paragraph 4 with reasonable promptness, Surety shall be deemed to be in default on this Bond 15 days after receipt of an additional written notice from Owner to Surety demanding that Surety perform its obligations under this Bond, and Owner shall be entitled to enforce any remedy available to Owner. If Surety proceeds as provided in Subparagraph 4.4, and Owner refuses the payment tendered or Surety has denied liability, in whole or in part, without further notice Owner shall be entitled to enforce any remedy available to Owner.

6. After Owner has terminated Contractor's right to complete the Contract, and if Surety elects to act under paragraph 4.1, 4.2, or 4.3 above, then the responsibilities of Surety to Owner shall not be greater than those of Contractor under the Contract, and the responsibilities of Owner to Surety shall not be greater than those of Owner under the Contract. To the limit of the amount of this Bond, but subject to commitment by Owner of the Balance of the Contract Price to mitigation of costs and damages on the Contract, the Surety is obligated without duplication for:

6.1. The responsibilities of Contractor for correction of defective Work and completion of the Contract;

6.2. Additional legal, design professional and delay costs resulting from Contractor's Default, and resulting from the actions of or failure to act of Surety under Paragraph 4; and

6.3. Liquidated damages, or if no liquidated damages are specified in the Contract, actual damages caused by delayed performance or non-performance of Contractor.

7. Surety shall not be liable to Owner or others for obligations of Contractor that are unrelated to the Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than Owner or its heirs, executors, administrators or successors.

8. Surety hereby waives notice of any change, including changes of time, to the Contract or to related subcontracts, purchase orders and other obligations.

9. Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the Work or part of the Work is located and shall be instituted within 2 years after Contractor Default or within 2 years after Contractor ceased working or within 2 years after Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

10. Notice to Surety, Owner or Contractor shall be mailed or delivered to the address indicated on the signature page.

11. When this Bond has been furnished to comply with a statutory requirement in the location where the Contract was to be performed, any provision in this Bond conflicting with said statutory requirement shall be deemed deleted here and provisions conforming to such statutory requirement shall be deemed incorporated herein. The intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

12. Definitions:

12.1. Balance of the Contract Price: The total amount payable by Owner to Contractor under the Contract after all proper adjustments have been made, including allowance to Contractor of any amounts received or to be received by Owner in settlement of insurance or other Claims for damages to which Contractor is entitled, reduced by all valid and proper payments made to or on behalf of Contractor under the Contract.

12.2. Contract: The agreement between Owner and Contractor identified on the signature page, including all Contract Documents and changes thereto.

12.3. Contractor Default: Failure of Contractor, which has neither been remedied nor waived, to perform or otherwise to comply with the terms of the Contract.

12.4. Owner Default: Failure of Owner, which has neither been remedied nor waived, to pay Contractor as required by the Contract or to perform and complete or comply with the other terms thereof.

END OF SECTION 00 61 14

SECTION 00 61 15 – PAYMENT BOND FORM

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

Contractor (Name and Address):

E T MacKenzie Company
4248 W Saginaw Hwy, Grand Ledge, MI 48837

Surety (Name and Address of Principal Place of Business):

Liberty Mutual Insurance Company
175 Berkeley Street, Boston, MA 02116

Owner

City of Grand Ledge
310 Greenwood Street
Grand Ledge, MI 48837

CONTRACT

Date (Date of Notice of Award): September 13, 2023
Amount: $2,945,974.25
Description: Well 2 Raw Water Main
Grand Ledge, MI

BOND

Bond Number: 013131657
Date (Not earlier than Contract Date): September 20, 2023
Amount: $2,945,974.25
Modifications to this Bond Form: See 00 61 15-3

Surety and Contractor, intending to be legally bound hereby, subject to the following terms set forth below, do each cause this Payment Bond to be duly executed by an authorized officer, agent, or representative.

Contractor AS PRINCIPAL

E T MacKenzie Company (Seal)
Contractor's Name and Corporate Seal

By: _____
Signature
Michael S. Marks
Print Name
President
Title

Attest: _____
Signature
Project Administrator
Title

SURETY

Liberty Mutual Insurance Company (Seal)
Surety's Name and Corporate Seal

By: _____
Signature (Attach Power of Attorney)
Robert G Chapman
Print Name
Attorney-in-Fact
Title

Attest: _____
Signature
Marcia J Miller
Title

IMPORTANT: Surety companies executing Bonds must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in Michigan. Attach Power of Attorney for those signatures executing for Surety, certifying authority to bind Surety as of the date of the Bond.

1. Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to Owner to pay for labor, materials and equipment furnished by Claimants for use in the performance of the Contract, which is incorporated herein by reference.

2. With respect to Owner, this obligation shall be null and void if Contractor:

2.1. promptly makes payment, directly or indirectly, for all sums due Claimants, and

2.2. defends, indemnifies and holds harmless Owner from all claims, demands, liens or suits alleging non-payment by Contractor by any person or entity who furnished labor, materials or equipment for use in the performance of the Contract, provided Owner has promptly notified Contractor and Surety (at the addresses described in Paragraph 12) of any claims, demands, liens or suits and tendered defense of such claims, demands, liens or suits to Contractor and Surety, and provided there is no Owner Default.

3. With respect to Claimants, this obligation shall be null and void if Contractor promptly makes payment, directly or indirectly, for all sums due.

4. Surety shall have no obligation to Claimants under this Bond until:

4.1. Claimants who are employed by or have a direct contract with Contractor have given notice to Surety (at the addresses described in paragraph 12) and sent a copy, or notice thereof, to Owner, stating that a claim is being made under this Bond and, with substantial accuracy, the amount of the claim.

4.2. Claimants who do not have a direct contract with Contractor:

4.2.1. Have furnished written notice to Contractor and sent a copy, or notice thereof, to Owner, within 90 days after having last performed labor or last furnished materials or equipment included in the claim stating, with substantial accuracy, the amount of the claim and the name of the party to whom the materials were furnished or supplied or for whom the labor was done or performed; and

4.2.2. Have either received a rejection in whole or in part from Contractor, or not received within 30 days of furnishing the above notice any communication from Contractor by which Contractor had indicated the claim will be paid directly or indirectly; and

4.2.3. Not having been paid within the above 30 days, have sent a written notice to Surety (at the address described in Paragraph 12) and sent a copy, or notice thereof, to Owner, stating that a claim is being made under this Bond and enclosing a copy of the previous written notice furnished to Contractor.

5. If a notice required by Paragraph 4 is given by Owner to Contractor or to Surety, that is sufficient compliance.

6. Reserved.

7. Surety's total obligation shall not exceed the amount of this Bond, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

8. Amounts owed by Owner to Contractor under the Contract shall be used for the performance of the Contract and to satisfy claims, if any, under any performance bond. By Contractor furnishing and Owner accepting this Bond, they agree that all funds earned by Contractor in the performance of the Contract are dedicated to satisfy obligations of Contractor and Surety under this Bond, subject to Owner's priority to use the funds for the completion of the Work.

9. Surety shall not be liable to Owner, Claimants or others for obligations of Contractor that are unrelated to the Contract. Owner shall not be liable for payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to, give notices on behalf of, or otherwise have obligations to Claimants under this Bond.

10. Surety hereby waives notice of any change, including changes of time, to the Contract or to related subcontracts, purchase orders and other obligations.

11. No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the location in which the Work or part of the Work is located or after the expiration of one year from the date (1) on which the Claimant give the notice required by paragraph 4.1 or paragraph 4.2.3, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

12. Notice to Surety, Owner or Contractor shall be mailed or delivered to the addresses indicated on the signature page. Actual receipt of notice by Surety, Owner or Contractor, however accomplished, shall be sufficient compliance as of the date received at the address indicated on the signature page.

13. When this Bond has been furnished to comply with a statutory requirement in the location where the Contract was to be performed, any provision in this Bond conflicting with said statutory requirement shall be deemed deleted herefrom and provisions conforming to such statutory requirement shall be deemed incorporated herein. The intent is that this Bond shall be construed as a statutory Bond and not as a common law bond.

14. Upon request of any person or entity appearing to be a potential beneficiary of this Bond, Contractor shall promptly furnish a copy of this Bond or shall permit a copy to be made.

15. DEFINITIONS:

15.1. Claimant: An individual or entity having a direct contract with Contractor or with a first-tier Subcontractor of Contractor, to furnish labor, materials or equipment for use in the performance of the Contract. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Contract, architectural and engineering services required for performance of the Work of Contractor and Contractor's Subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.

15.2. Contract: The agreement between Owner and Contractor identified on the signature page, including all Contract Documents and changes thereto.

15.3. Owner Default: Failure of Owner, which has neither been remedied nor waived, to pay Contractor as required by the Contract, or to perform and complete or comply with the other terms thereof.

See Modifications Below

END OF SECTION 00 61 15

Modifications:

Nothwithstanding any contrary provision herein, the rights created by this bond shall be construed strictly according to the provisions of Michigan Public Act No 213 of the Public Acts of 1963, as amended.

This Power of Attorney limits the acts of those named herein, and they have no authority to bind the Company except in the manner and to the extent herein stated.

Liberty Mutual Insurance Company
The Ohio Casualty Insurance Company
West American Insurance Company

Certificate No: **8208121-013057**

POWER OF ATTORNEY

KNOWN ALL PERSONS BY THESE PRESENTS: That The Ohio Casualty Insurance Company is a corporation duly organized under the laws of the State of New Hampshire, that Liberty Mutual Insurance Company is a corporation duly organized under the laws of the State of Massachusetts, and West American Insurance Company is a corporation duly organized under the laws of the State of Indiana (herein collectively called the "Companies"), pursuant to and by authority herein set forth, does hereby name, constitute and appoint, Cloyd W. Barnes; Curtis M. Peterson; David G. Chapman; Marcia J. Miller; Nathan G. Chapman; Nicole Andries; Robert G. Chapman; Ryan A. Peterson

all of the city of Lansing state of MI each individually if there be more than one named, its true and lawful attorney-in-fact to make, execute, seal, acknowledge and deliver, for and on its behalf as surety and as its act and deed, any and all undertakings, bonds, recognizances and other surety obligations, in pursuance of these presents and shall be as binding upon the Companies as if they have been duly signed by the president and attested by the secretary of the Companies in their own proper persons.

IN WITNESS WHEREOF, this Power of Attorney has been subscribed by an authorized officer or official of the Companies and the corporate seals of the Companies have been affixed thereto this 6th day of June, 2022.

Liberty Mutual Insurance Company
The Ohio Casualty Insurance Company
West American Insurance Company

By: _____
David M. Carey, Assistant Secretary

State of PENNSYLVANIA
County of MONTGOMERY ss

On this 6th day of June, 2022 before me personally appeared David M. Carey, who acknowledged himself to be the Assistant Secretary of Liberty Mutual Insurance Company, The Ohio Casualty Company, and West American Insurance Company, and that he, as such, being authorized so to do, execute the foregoing instrument for the purposes therein contained by signing on behalf of the corporations by himself as a duly authorized officer.

IN WITNESS WHEREOF, I have hereunto subscribed my name and affixed my notarial seal at King of Prussia, Pennsylvania, on the day and year first above written.

Commonwealth of Pennsylvania - Notary Seal
Teresa Pastella, Notary Public
Montgomery County
My commission expires March 28, 2025
Commission number 1126044
Member, Pennsylvania Association of Notaries

By: _____
Teresa Pastella, Notary Public

This Power of Attorney is made and executed pursuant to and by authority of the following By-laws and Authorizations of The Ohio Casualty Insurance Company, Liberty Mutual Insurance Company, and West American Insurance Company which resolutions are now in full force and effect reading as follows:

ARTICLE IV – OFFICERS: Section 12. Power of Attorney.
Any officer or other official of the Corporation authorized for that purpose in writing by the Chairman or the President, and subject to such limitation as the Chairman or the President may prescribe, shall appoint such attorneys-in-fact, as may be necessary to act in behalf of the Corporation to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations. Such attorneys-in-fact, subject to the limitations set forth in their respective powers of attorney, shall have full power to bind the Corporation by their signature and execution of any such instruments and to attach thereto the seal of the Corporation. When so executed, such instruments shall be as binding as if signed by the President and attested to by the Secretary. Any power or authority granted to any representative or attorney-in-fact under the provisions of this article may be revoked at any time by the Board, the Chairman, the President or by the officer or officers granting such power or authority.

ARTICLE XIII – Execution of Contracts: Section 5. Surety Bonds and Undertakings.
Any officer of the Company authorized for that purpose in writing by the chairman or the president, and subject to such limitations as the chairman or the president may prescribe, shall appoint such attorneys-in-fact, as may be necessary to act in behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations. Such attorneys-in-fact subject to the limitations set forth in their respective powers of attorney, shall have full power to bind the Company by their signature and execution of any such instruments and to attach thereto the seal of the Company. When so executed such instruments shall be as binding as if signed by the president and attested by the secretary.

Certificate of Designation – The President of the Company, acting pursuant to the Bylaws of the Company, authorizes David M. Carey, Assistant Secretary to appoint such attorneys-in-fact as may be necessary to act on behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations.

Authorization – By unanimous consent of the Company's Board of Directors, the Company consents that facsimile or mechanically reproduced signature of any assistant secretary of the Company, wherever appearing upon a certified copy of any power of attorney issued by the Company in connection with surety bonds, shall be valid and binding upon the Company with the same force and effect as though manually affixed.

I, Renee C. Llewellyn, the undersigned, Assistant Secretary, The Ohio Casualty Insurance Company, Liberty Mutual Insurance Company, and West American Insurance Company do hereby certify that the original power of attorney of which the foregoing is a full, true and correct copy of the Power of Attorney executed by said Companies, is in full force and effect and has not been revoked.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed the seals of said Companies this 20th day of September, 2023.

By: _____
Renee C. Llewellyn, Assistant Secretary

Not valid for mortgage, note, loan, letter of credit, currency rate, interest rate or residual value guarantees.

For bond and/or Power of Attorney (POA) verification inquiries, please call 610-832-8240 or email HOSUR@libertymutual.com.

SECTION 00 65 16 – CERTIFICATE OF SUBSTANTIAL COMPLETION FORM

Date of Issuance: _____

Owner: _____

Contractor: _____

Contract: Well 2 Raw Water Main
Grand Ledge, Michigan
Project Number 221916

This definitive Certificate of Substantial Completion applies to all Work under the Contract Documents.

_____
Date of Substantial Completion

The Work to which this Certificate applies has been inspected by authorized representatives of Owner, Contractor and Engineer, and found to be substantially complete. The Date of Substantial Completion of the Project or portion thereof designated above is hereby declared and is also the date of commencement of applicable warranties required by the Contract Documents, except as stated below:

A definitive list of items to be completed or corrected is attached hereto. This list may not be all-inclusive, and the failure to include an item in such list does not alter the responsibility of the Contractor to complete all the Work in accordance with the Contract Documents.

The responsibilities between Owner and Contractor for security, operation, safety, maintenance, heat, utilities, insurance and warranties shall be as provided in the Contract Document, except as amended as follows:

Owner's Amended Responsibilities: _____
_____
_____

Contractor's Amended Responsibilities: _____
_____
_____

The following documents are attached to and made a part of this Certificate:

1. List of items to be completed or corrected before final payment.

This certificate does not constitute an acceptance of Work not in accordance with the Contract Documents nor is it a release of Contractor's obligation to complete the Work in accordance with the Contract Documents.

Executed by Engineer on _____
Date

_____
Engineer

By: _____
(Authorized Signature)

Contractor accepts this Certificate of Substantial Completion on _____
Date

_____
Contractor

By: _____
(Authorized Signature)

Owner accepts this Certificate of Substantial Completion on _____
Date

_____
Owner

By: _____
(Authorized Signature)

END OF SECTION 00 65 16

SECTION 00 65 26 – AFFIDAVIT AND CONSENT OF SURETY

STATE OF MICHIGAN)
) ss.
COUNTY OF _____)

The undersigned Contractor, being duly sworn, deposes and says that he entered into an Agreement (Contract) with City of Grand Ledge (Owner), on the _____ day of _____ 20__, for the performance of certain Work generally described as follows: Well 2 Raw Water Main project.

Contractor further says that the Work under the terms of the Contract has been completed and all sums due to Contractors, Subcontractors, Suppliers and laborers with whom Contractor has contracted for performance under the Contract have been paid in full.

Furthermore, in consideration of final payment under the Contract, Contractor hereby waives and releases any and all claims or rights which Contractor may have in connection with the Contract against Owner or the premises upon which the Work was performed, and agrees to indemnify Owner against any and all such claims or rights which may be asserted by Contractors, Subcontractors, Suppliers or laborers with whom Contractor has contracted for performance under the Contract.

Signed in the presence of:

_____ _____
Contractor*

_____ _____
Signature

_____
Name and Title*

Subscribed and sworn to before me this _____ day of _____, 20__.

_____

Notary Public _____

My commission expires:_____ County _____

CONSENT OF SURETY

The undersigned, as Surety on the Contract, hereby consents to the making of final payment to the Contractor under the Contract.

Date:_____, 20__

_____
Surety Company*

_____
Attorney-in-Fact (Signature)

_____
Name and Title*

*Typed or printed in ink.

(Attach copy of power of attorney certified to date of consent.)

END OF SECTION 00 65 26

This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the controlling Laws and Regulations.

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared By

EJCDC®
ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

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STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

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STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

ARTICLE 1—DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

A. Wherever used in the Bidding Requirements or Contract Documents, a term printed with initial capital letters, including the term's singular and plural forms, will have the meaning indicated in the definitions below. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.

1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.

2. *Agreement*—The written instrument, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.

3. *Application for Payment*—The document prepared by Contractor, in a form acceptable to Engineer, to request progress or final payments, and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

4. *Bid*—The offer of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

5. *Bidder*—An individual or entity that submits a Bid to Owner.

6. *Bidding Documents*—The Bidding Requirements, the proposed Contract Documents, and all Addenda.

7. *Bidding Requirements*—The Advertisement or invitation to bid, Instructions to Bidders, Bid Bond or other Bid security, if any, the Bid Form, and the Bid with any attachments.

8. *Change Order*—A document which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, or other revision to the Contract, issued on or after the Effective Date of the Contract.

9. *Change Proposal*—A written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; challenging a set-off against payments due; or seeking other relief with respect to the terms of the Contract.

10. *Claim*

a. A demand or assertion by Owner directly to Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment of Contract Price or Contract Times; contesting an initial decision by Engineer concerning the

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requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Engineer's decision regarding a Change Proposal; seeking resolution of a contractual issue that Engineer has declined to address; or seeking other relief with respect to the terms of the Contract.

b. A demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer's decision regarding a Change Proposal, or seeking resolution of a contractual issue that Engineer has declined to address.

c. A demand or assertion by Owner or Contractor, duly submitted in compliance with the procedural requirements set forth herein, made pursuant to Paragraph 12.01.A.4, concerning disputes arising after Engineer has issued a recommendation of final payment.

d. A demand for money or services by a third party is not a Claim.

11. *Constituent of Concern*—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), lead-based paint (as defined by the HUD/EPA standard), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to Laws and Regulations regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.

12. *Contract*—The entire and integrated written contract between Owner and Contractor concerning the Work.

13. *Contract Documents*—Those items so designated in the Agreement, and which together comprise the Contract.

14. *Contract Price*—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents.

15. *Contract Times*—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.

16. *Contractor*—The individual or entity with which Owner has contracted for performance of the Work.

17. *Cost of the Work*—See Paragraph 13.01 for definition.

18. *Drawings*—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.

19. *Effective Date of the Contract*—The date, indicated in the Agreement, on which the Contract becomes effective.

20. *Electronic Document*—Any Project-related correspondence, attachments to correspondence, data, documents, drawings, information, or graphics, including but not limited to Shop Drawings and other Submittals, that are in an electronic or digital format.

21. *Electronic Means*—Electronic mail (email), upload/download from a secure Project website, or other communications methods that allow: (a) the transmission or communication of Electronic Documents; (b) the documentation of transmissions, including sending and receipt; (c) printing of the transmitted Electronic Document by the

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recipient; (d) the storage and archiving of the Electronic Document by sender and recipient; and (e) the use by recipient of the Electronic Document for purposes permitted by this Contract. Electronic Means does not include the use of text messaging, or of Facebook, Twitter, Instagram, or similar social media services for transmission of Electronic Documents.

22. *Engineer*—The individual or entity named as such in the Agreement.

23. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but does not change the Contract Price or the Contract Times.

24. *Hazardous Environmental Condition*—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto.

    a. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated into the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, is not a Hazardous Environmental Condition.

    b. The presence of Constituents of Concern that are to be removed or remediated as part of the Work is not a Hazardous Environmental Condition.

    c. The presence of Constituents of Concern as part of the routine, anticipated, and obvious working conditions at the Site, is not a Hazardous Environmental Condition.

25. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and binding decrees, resolutions, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

26. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.

27. *Milestone*—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date, or by a time prior to Substantial Completion of all the Work.

28. *Notice of Award*—The written notice by Owner to a Bidder of Owner's acceptance of the Bid.

29. *Notice to Proceed*—A written notice by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work.

30. *Owner*—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract.

31. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising Contractor's plan to accomplish the Work within the Contract Times.

32. *Project*—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.

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33. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative (RPR) includes any assistants or field staff of Resident Project Representative.

34. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.

35. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer's review of the submittals.

36. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

37. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.

38. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements, and such other lands or areas furnished by Owner which are designated for the use of Contractor.

39. *Specifications*—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.

40. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work.

41. *Submittal*—A written or graphic document, prepared by or for Contractor, which the Contract Documents require Contractor to submit to Engineer, or that is indicated as a Submittal in the Schedule of Submittals accepted by Engineer. Submittals may include Shop Drawings and Samples; schedules; product data; Owner-delegated designs; sustainable design information; information on special procedures; testing plans; results of tests and evaluations, source quality-control testing and inspections, and field or Site quality-control testing and inspections; warranties and certifications; Suppliers' instructions and reports; records of delivery of spare parts and tools; operations and maintenance data; Project photographic documentation; record documents; and other such documents required by the Contract Documents. Submittals, whether or not approved or accepted by Engineer, are not Contract Documents. Change Proposals, Change Orders, Claims, notices, Applications for Payment, and requests for interpretation or clarification are not Submittals.

42. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion of such Work.

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43. *Successful Bidder*—The Bidder to which the Owner makes an award of contract.

44. *Supplementary Conditions*—The part of the Contract that amends or supplements these General Conditions.

45. *Supplier*—A manufacturer, fabricator, supplier, distributor, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or a Subcontractor.

46. *Technical Data*

    a. Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (1) existing subsurface conditions at or adjacent to the Site, or existing physical conditions at or adjacent to the Site including existing surface or subsurface structures (except Underground Facilities) or (2) Hazardous Environmental Conditions at the Site.

    b. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then Technical Data is defined, with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06, as the data contained in boring logs, recorded measurements of subsurface water levels, assessments of the condition of subsurface facilities, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical, environmental, or other Site or facilities conditions report prepared for the Project and made available to Contractor.

    c. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data, and instead Underground Facilities are shown or indicated on the Drawings.

47. *Underground Facilities*—All active or not-in-service underground lines, pipelines, conduits, ducts, encasements, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or systems at the Site, including but not limited to those facilities or systems that produce, transmit, distribute, or convey telephone or other communications, cable television, fiber optic transmissions, power, electricity, light, heat, gases, oil, crude oil products, liquid petroleum products, water, steam, waste, wastewater, storm water, other liquids or chemicals, or traffic or other control systems. An abandoned facility or system is not an Underground Facility.

48. *Unit Price Work*—Work to be paid for on the basis of unit prices.

49. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.

50. *Work Change Directive*—A written directive to Contractor issued on or after the Effective Date of the Contract, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work.

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1.02 *Terminology*

A. The words and terms discussed in Paragraphs 1.02.B, C, D, and E are not defined terms that require initial capital letters, but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.

B. *Intent of Certain Terms or Adjectives*: The Contract Documents include the terms "as allowed," "as approved," "as ordered," "as directed" or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives "reasonable," "suitable," "acceptable," "proper," "satisfactory," or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Article 10 or any other provision of the Contract Documents.

C. *Day*: The word "day" means a calendar day of 24 hours measured from midnight to the next midnight.

D. *Defective*: The word "defective," when modifying the word "Work," refers to Work that is unsatisfactory, faulty, or deficient in that it:

1. does not conform to the Contract Documents;

2. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or

3. has been damaged prior to Engineer's recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 15.03 or Paragraph 15.04).

E. *Furnish, Install, Perform, Provide*

1. The word "furnish," when used in connection with services, materials, or equipment, means to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.

2. The word "install," when used in connection with services, materials, or equipment, means to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

3. The words "perform" or "provide," when used in connection with services, materials, or equipment, means to furnish and install said services, materials, or equipment complete and ready for intended use.

4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words "furnish," "install," "perform," or "provide," then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.

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F. *Contract Price or Contract Times*: References to a change in "Contract Price or Contract Times" or "Contract Times or Contract Price" or similar, indicate that such change applies to (1) Contract Price, (2) Contract Times, or (3) both Contract Price and Contract Times, as warranted, even if the term "or both" is not expressed.

G. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2—PRELIMINARY MATTERS

2.01 *Delivery of Performance and Payment Bonds; Evidence of Insurance*

A. *Performance and Payment Bonds*: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner the performance bond and payment bond (if the Contract requires Contractor to furnish such bonds).

B. *Evidence of Contractor's Insurance*: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each additional insured (as identified in the Contract), the certificates, endorsements, and other evidence of insurance required to be provided by Contractor in accordance with Article 6, except to the extent the Supplementary Conditions expressly establish other dates for delivery of specific insurance policies.

C. *Evidence of Owner's Insurance*: After receipt of the signed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each additional insured (as identified in the Contract), the certificates and other evidence of insurance required to be provided by Owner under Article 6.

2.02 *Copies of Documents*

A. Owner shall furnish to Contractor four printed copies of the Contract (including one fully signed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional printed copies will be furnished upon request at the cost of reproduction.

B. Owner shall maintain and safeguard at least one original printed record version of the Contract, including Drawings and Specifications signed and sealed by Engineer and other design professionals. Owner shall make such original printed record version of the Contract available to Contractor for review. Owner may delegate the responsibilities under this provision to Engineer.

2.03 *Before Starting Construction*

A. *Preliminary Schedules*: Within 10 days after the Effective Date of the Contract (or as otherwise required by the Contract Documents), Contractor shall submit to Engineer for timely review:

1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract;

2. a preliminary Schedule of Submittals; and

3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work

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into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.04 *Preconstruction Conference; Designation of Authorized Representatives*

A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work, and to discuss the schedules referred to in Paragraph 2.03.A, procedures for handling Shop Drawings, Samples, and other Submittals, processing Applications for Payment, electronic or digital transmittals, and maintaining required records.

B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit and receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.05 *Acceptance of Schedules*

A. At least 10 days before submission of the first Application for Payment a conference, attended by Contractor, Engineer, and others as appropriate, will be held to review the schedules submitted in accordance with Paragraph 2.03.A. No progress payment will be made to Contractor until acceptable schedules are submitted to Engineer.

1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.

2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.

3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to the component parts of the Work.

4. If a schedule is not acceptable, Contractor will have an additional 10 days to revise and resubmit the schedule.

2.06 *Electronic Transmittals*

A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may send, and shall accept, Electronic Documents transmitted by Electronic Means.

B. If the Contract does not establish protocols for Electronic Means, then Owner, Engineer, and Contractor shall jointly develop such protocols.

C. Subject to any governing protocols for Electronic Means, when transmitting Electronic Documents by Electronic Means, the transmitting party makes no representations as to long-term compatibility, usability, or readability of the Electronic Documents resulting from the recipient's use of software application packages, operating systems, or computer hardware differing from those used in the drafting or transmittal of the Electronic Documents.

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ARTICLE 3—CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 *Intent*

A. The Contract Documents are complementary; what is required by one Contract Document is as binding as if required by all.

B. It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents.

C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic versions of the Contract Documents (including any printed copies derived from such electronic versions) and the printed record version, the printed record version will govern.

D. The Contract supersedes prior negotiations, representations, and agreements, whether written or oral.

E. Engineer will issue clarifications and interpretations of the Contract Documents as provided herein.

F. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation will be deemed stricken, and all remaining provisions will continue to be valid and binding upon Owner and Contractor, which agree that the Contract Documents will be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

G. Nothing in the Contract Documents creates:

1. any contractual relationship between Owner or Engineer and any Subcontractor, Supplier, or other individual or entity performing or furnishing any of the Work, for the benefit of such Subcontractor, Supplier, or other individual or entity; or

2. any obligation on the part of Owner or Engineer to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity, except as may otherwise be required by Laws and Regulations.

3.02 *Reference Standards*

A. *Standards Specifications, Codes, Laws and Regulations*

1. Reference in the Contract Documents to standard specifications, manuals, reference standards, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, means the standard specification, manual, reference standard, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Contract if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.

2. No provision of any such standard specification, manual, reference standard, or code, and no instruction of a Supplier, will be effective to change the duties or responsibilities of Owner, Contractor, or Engineer from those set forth in the part of the Contract Documents prepared by or for Engineer. No such provision or instruction shall be effective to assign to Owner or Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility

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inconsistent with the provisions of the part of the Contract Documents prepared by or for Engineer.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies*

1. *Contractor's Verification of Figures and Field Measurements*: Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall not proceed with any Work affected thereby until the conflict, error, ambiguity, or discrepancy is resolved by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract issued pursuant to Paragraph 11.01.

2. *Contractor's Review of Contract Documents*: If, before or during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) actual field conditions, (c) any standard specification, manual, reference standard, or code, or (d) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 7.15) until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract issued pursuant to Paragraph 11.01.

3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. *Resolving Discrepancies*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the part of the Contract Documents prepared by or for Engineer take precedence in resolving any conflict, error, ambiguity, or discrepancy between such provisions of the Contract Documents and:

a. the provisions of any standard specification, manual, reference standard, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference as a Contract Document); or

b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Requirements of the Contract Documents*

A. During the performance of the Work and until final payment, Contractor and Owner shall submit to the Engineer in writing all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work.

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B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal, and on Owner, unless it appeals by filing a Claim.

C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly notify Owner and Contractor in writing that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 12.

3.05 *Reuse of Documents*

A. Contractor and its Subcontractors and Suppliers shall not:

1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media versions, or reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer; or

2. have or acquire any title or ownership rights in any other Contract Documents, reuse any such Contract Documents for any purpose without Owner's express written consent, or violate any copyrights pertaining to such Contract Documents.

B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein precludes Contractor from retaining copies of the Contract Documents for record purposes.

ARTICLE 4—COMMENCEMENT AND PROGRESS OF THE WORK

4.01 *Commencement of Contract Times; Notice to Proceed*

A. The Contract Times will commence to run on the 30th day after the Effective Date of the Contract or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Contract. In no event will the Contract Times commence to run later than the 60th day after the day of Bid opening or the 30th day after the Effective Date of the Contract, whichever date is earlier.

4.02 *Starting the Work*

A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work may be done at the Site prior to such date.

4.03 *Reference Points*

A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the

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established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.04 *Progress Schedule*

A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.05 as it may be adjusted from time to time as provided below.

1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.05) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.

2. Proposed adjustments in the Progress Schedule that will change the Contract Times must be submitted in accordance with the requirements of Article 11.

B. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work will be delayed or postponed pending resolution of any disputes or disagreements, or during any appeal process, except as permitted by Paragraph 16.04, or as Owner and Contractor may otherwise agree in writing.

4.05 *Delays in Contractor's Progress*

A. If Owner, Engineer, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times.

B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.

C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times. Such an adjustment will be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:

1. Severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;

2. Abnormal weather conditions;

3. Acts or failures to act of third-party utility owners or other third-party entities (other than those third-party utility owners or other third-party entities performing other work at or adjacent to the Site as arranged by or under contract with Owner, as contemplated in Article 8); and

4. Acts of war or terrorism.

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D. Contractor's entitlement to an adjustment of Contract Times or Contract Price is limited as follows:

1. Contractor's entitlement to an adjustment of the Contract Times is conditioned on the delay, disruption, or interference adversely affecting an activity on the critical path to completion of the Work, as of the time of the delay, disruption, or interference.

2. Contractor shall not be entitled to an adjustment in Contract Price for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor. Such a concurrent delay by Contractor shall not preclude an adjustment of Contract Times to which Contractor is otherwise entitled.

3. Adjustments of Contract Times or Contract Price are subject to the provisions of Article 11.

E. Each Contractor request or Change Proposal seeking an increase in Contract Times or Contract Price must be supplemented by supporting data that sets forth in detail the following:

1. The circumstances that form the basis for the requested adjustment;

2. The date upon which each cause of delay, disruption, or interference began to affect the progress of the Work;

3. The date upon which each cause of delay, disruption, or interference ceased to affect the progress of the Work;

4. The number of days' increase in Contract Times claimed as a consequence of each such cause of delay, disruption, or interference; and

5. The impact on Contract Price, in accordance with the provisions of Paragraph 11.07.

Contractor shall also furnish such additional supporting documentation as Owner or Engineer may require including, where appropriate, a revised progress schedule indicating all the activities affected by the delay, disruption, or interference, and an explanation of the effect of the delay, disruption, or interference on the critical path to completion of the Work.

F. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5, together with the provisions of Paragraphs 4.05.D and 4.05.E.

G. Paragraph 8.03 addresses delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.

ARTICLE 5—SITE; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

5.01 *Availability of Lands*

A. Owner shall furnish the Site. Owner shall notify Contractor in writing of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work.

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B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which permanent improvements are to be made and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.

C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

5.02 *Use of Site and Other Areas*

A. *Limitation on Use of Site and Other Areas*

1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas, or to improvements, structures, utilities, or similar facilities located at such adjacent lands or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.

2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.13, or otherwise; (b) promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or in a court of competent jurisdiction; and (c) to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from and against any such claim, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused directly or indirectly, in whole or in part by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.

B. *Removal of Debris During Performance of the Work*: During the progress of the Work the Contractor shall keep the Site and other adjacent areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris will conform to applicable Laws and Regulations.

C. *Cleaning*: Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site and adjacent areas all tools, appliances, construction equipment

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and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

D. *Loading of Structures*: Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent structures or land to stresses or pressures that will endanger them.

5.03 *Subsurface and Physical Conditions*

A. *Reports and Drawings*: The Supplementary Conditions identify:

1. Those reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data;

2. Those drawings of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities), that contain Technical Data; and

3. Technical Data contained in such reports and drawings.

B. *Underground Facilities*: Underground Facilities are shown or indicated on the Drawings, pursuant to Paragraph 5.05, and not in the drawings referred to in Paragraph 5.03.A. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data.

C. *Reliance by Contractor on Technical Data*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely upon the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b.

D. *Limitations of Other Data and Documents*: Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto;

2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings;

3. the contents of other Site-related documents made available to Contractor, such as record drawings from other projects at or adjacent to the Site, or Owner's archival documents concerning the Site; or

4. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.

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5.04 *Differing Subsurface or Physical Conditions*

A. *Notice by Contractor*: If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site:

1. is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate;

2. is of such a nature as to require a change in the Drawings or Specifications;

3. differs materially from that shown or indicated in the Contract Documents; or

4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.

B. *Engineer's Review*: After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine whether it is necessary for Owner to obtain additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.

C. *Owner's Statement to Contractor Regarding Site Condition*: After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.

D. *Early Resumption of Work*: If at any time Engineer determines that Work in connection with the subsurface or physical condition in question may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the condition in question has been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.

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E. *Possible Price and Times Adjustments*

1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

    a. Such condition must fall within any one or more of the categories described in Paragraph 5.04.A;

    b. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03; and,

    c. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E.

2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:

    a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise;

    b. The existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or

    c. Contractor failed to give the written notice required by Paragraph 5.04.A.

3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, then any such adjustment will be set forth in a Change Order.

4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.

F. *Underground Facilities; Hazardous Environmental Conditions*: Paragraph 5.05 governs rights and responsibilities regarding the presence or location of Underground Facilities. Paragraph 5.06 governs rights and responsibilities regarding Hazardous Environmental Conditions. The provisions of Paragraphs 5.03 and 5.04 are not applicable to the presence or location of Underground Facilities, or to Hazardous Environmental Conditions.

5.05 *Underground Facilities*

A. *Contractor's Responsibilities*: Unless it is otherwise expressly provided in the Supplementary Conditions, the cost of all of the following are included in the Contract Price, and Contractor shall have full responsibility for:

1. reviewing and checking all information and data regarding existing Underground Facilities at the Site;

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2. complying with applicable state and local utility damage prevention Laws and Regulations;

3. verifying the actual location of those Underground Facilities shown or indicated in the Contract Documents as being within the area affected by the Work, by exposing such Underground Facilities during the course of construction;

4. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and

5. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.

B. *Notice by Contractor*: If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated on the Drawings, or was not shown or indicated on the Drawings with reasonable accuracy, then Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing regarding such Underground Facility.

C. *Engineer's Review*: Engineer will:

1. promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated on the Drawings, or was not shown or indicated with reasonable accuracy;

2. identify and communicate with the owner of the Underground Facility; prepare recommendations to Owner (and if necessary issue any preliminary instructions to Contractor) regarding the Contractor's resumption of Work in connection with the Underground Facility in question;

3. obtain any pertinent cost or schedule information from Contractor; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and

4. advise Owner in writing of Engineer's findings, conclusions, and recommendations.

During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

D. *Owner's Statement to Contractor Regarding Underground Facility*: After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations in whole or in part.

E. *Early Resumption of Work*: If at any time Engineer determines that Work in connection with the Underground Facility may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the Underground Facility in question and conditions affected by its presence have been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.

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F. *Possible Price and Times Adjustments*

1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, to the extent that any existing Underground Facility at the Site that was not shown or indicated on the Drawings, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

    a. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03;

    b. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E; and

    c. Contractor gave the notice required in Paragraph 5.05.B.

2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, then any such adjustment will be set forth in a Change Order.

3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.

4. The information and data shown or indicated on the Drawings with respect to existing Underground Facilities at the Site is based on information and data (a) furnished by the owners of such Underground Facilities, or by others, (b) obtained from available records, or (c) gathered in an investigation conducted in accordance with the current edition of ASCE 38, Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data, by the American Society of Civil Engineers. If such information or data is incorrect or incomplete, Contractor's remedies are limited to those set forth in this Paragraph 5.05.F.

5.06 *Hazardous Environmental Conditions at Site*

A. *Reports and Drawings*: The Supplementary Conditions identify:

1. those reports known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site;

2. drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and

3. Technical Data contained in such reports and drawings.

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B. *Reliance by Contractor on Technical Data Authorized*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto;

2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or

3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions or information.

C. Contractor shall not be responsible for removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.

D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.

E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.

F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition

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and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.

G. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, as a result of such Work stoppage, such special conditions under which Work is agreed to be resumed by Contractor, or any costs or expenses incurred in response to the Hazardous Environmental Condition, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off. Entitlement to any such adjustment is subject to the provisions of Paragraphs 4.05.D, 4.05.E, 11.07, and 11.08.

H. If, after receipt of such written notice, Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.

I. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court, arbitration, or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.I obligates Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

J. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J obligates Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

K. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

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ARTICLE 6—BONDS AND INSURANCE

6.01 *Performance, Payment, and Other Bonds*

A. Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of Contractor's obligations under the Contract. These bonds must remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 15.08, whichever is later, except as provided otherwise by Laws or Regulations, the terms of a prescribed bond form, the Supplementary Conditions, or other provisions of the Contract.

B. Contractor shall also furnish such other bonds (if any) as are required by the Supplementary Conditions or other provisions of the Contract.

C. All bonds must be in the form included in the Bidding Documents or otherwise specified by Owner prior to execution of the Contract, except as provided otherwise by Laws or Regulations, and must be issued and signed by a surety named in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Department Circular 570 (as amended and supplemented) by the Bureau of the Fiscal Service, U.S. Department of the Treasury. A bond signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority must show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.

D. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue bonds in the required amounts.

E. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer in writing and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which must comply with the bond and surety requirements above.

F. If Contractor has failed to obtain a required bond, Owner may exclude the Contractor from the Site and exercise Owner's termination rights under Article 16.

G. Upon request to Owner from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Owner shall provide a copy of the payment bond to such person or entity.

H. Upon request to Contractor from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Contractor shall provide a copy of the payment bond to such person or entity.

6.02 *Insurance—General Provisions*

A. Owner and Contractor shall obtain and maintain insurance as required in this article and in the Supplementary Conditions.

B. All insurance required by the Contract to be purchased and maintained by Owner or Contractor shall be obtained from insurance companies that are duly licensed or authorized in the state or jurisdiction in which the Project is located to issue insurance policies for the

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required limits and coverages. Unless a different standard is indicated in the Supplementary Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.

C. Alternative forms of insurance coverage, including but not limited to self-insurance and "Occupational Accident and Excess Employer's Indemnity Policies," are not sufficient to meet the insurance requirements of this Contract, unless expressly allowed in the Supplementary Conditions.

D. Contractor shall deliver to Owner, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Contractor has obtained and is maintaining the policies and coverages required by the Contract. Upon request by Owner or any other insured, Contractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies, documentation of applicable self-insured retentions (if allowed) and deductibles, full disclosure of all relevant exclusions, and evidence of insurance required to be purchased and maintained by Subcontractors or Suppliers. In any documentation furnished under this provision, Contractor, Subcontractors, and Suppliers may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those applicable to this Contract.

E. Owner shall deliver to Contractor, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Owner has obtained and is maintaining the policies and coverages required of Owner by the Contract (if any). Upon request by Contractor or any other insured, Owner shall also provide other evidence of such required insurance (if any), including but not limited to copies of policies, documentation of applicable self-insured retentions (if allowed) and deductibles, and full disclosure of all relevant exclusions. In any documentation furnished under this provision, Owner may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those relevant to this Contract.

F. Failure of Owner or Contractor to demand such certificates or other evidence of the other party's full compliance with these insurance requirements, or failure of Owner or Contractor to identify a deficiency in compliance from the evidence provided, will not be construed as a waiver of the other party's obligation to obtain and maintain such insurance.

G. In addition to the liability insurance required to be provided by Contractor, the Owner, at Owner's option, may purchase and maintain Owner's own liability insurance. Owner's liability policies, if any, operate separately and independently from policies required to be provided by Contractor, and Contractor cannot rely upon Owner's liability policies for any of Contractor's obligations to the Owner, Engineer, or third parties.

H. Contractor shall require:

1. Subcontractors to purchase and maintain worker's compensation, commercial general liability, and other insurance that is appropriate for their participation in the Project, and to name as additional insureds Owner and Engineer (and any other individuals or entities identified in the Supplementary Conditions as additional insureds on Contractor's liability policies) on each Subcontractor's commercial general liability insurance policy; and

2. Suppliers to purchase and maintain insurance that is appropriate for their participation in the Project.

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I. If either party does not purchase or maintain the insurance required of such party by the Contract, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage.

J. If Contractor has failed to obtain and maintain required insurance, Contractor's entitlement to enter or remain at the Site will end immediately, and Owner may impose an appropriate set-off against payment for any associated costs (including but not limited to the cost of purchasing necessary insurance coverage), and exercise Owner's termination rights under Article 16.

K. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect (but is in no way obligated) to obtain equivalent insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and the Contract Price will be adjusted accordingly.

L. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests. Contractor is responsible for determining whether such coverage and limits are adequate to protect its interests, and for obtaining and maintaining any additional insurance that Contractor deems necessary.

M. The insurance and insurance limits required herein will not be deemed as a limitation on Contractor's liability, or that of its Subcontractors or Suppliers, under the indemnities granted to Owner and other individuals and entities in the Contract or otherwise.

N. All the policies of insurance required to be purchased and maintained under this Contract will contain a provision or endorsement that the coverage afforded will not be canceled, or renewal refused, until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured and Engineer.

6.03 *Contractor's Insurance*

A. *Required Insurance*: Contractor shall purchase and maintain Worker's Compensation, Commercial General Liability, and other insurance pursuant to the specific requirements of the Supplementary Conditions.

B. *General Provisions*: The policies of insurance required by this Paragraph 6.03 as supplemented must:

1. include at least the specific coverages required;

2. be written for not less than the limits provided, or those required by Laws or Regulations, whichever is greater;

3. remain in effect at least until the Work is complete (as set forth in Paragraph 15.06.D), and longer if expressly required elsewhere in this Contract, and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work as a warranty or correction obligation, or otherwise, or returning to the Site to conduct other tasks arising from the Contract;

4. apply with respect to the performance of the Work, whether such performance is by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed

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by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable; and

5. include all necessary endorsements to support the stated requirements.

C. *Additional Insureds*: The Contractor's commercial general liability, automobile liability, employer's liability, umbrella or excess, pollution liability, and unmanned aerial vehicle liability policies, if required by this Contract, must:

1. include and list as additional insureds Owner and Engineer, and any individuals or entities identified as additional insureds in the Supplementary Conditions;

2. include coverage for the respective officers, directors, members, partners, employees, and consultants of all such additional insureds;

3. afford primary coverage to these additional insureds for all claims covered thereby (including as applicable those arising from both ongoing and completed operations);

4. not seek contribution from insurance maintained by the additional insured; and

5. as to commercial general liability insurance, apply to additional insureds with respect to liability caused in whole or in part by Contractor's acts or omissions, or the acts and omissions of those working on Contractor's behalf, in the performance of Contractor's operations.

6.04 *Builder's Risk and Other Property Insurance*

A. *Builder's Risk*: Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the Work's full insurable replacement cost (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). The specific requirements applicable to the builder's risk insurance are set forth in the Supplementary Conditions.

B. *Property Insurance for Facilities of Owner Where Work Will Occur*: Owner is responsible for obtaining and maintaining property insurance covering each existing structure, building, or facility in which any part of the Work will occur, or to which any part of the Work will attach or be adjoined. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, providing coverage consistent with that required for the builder's risk insurance, and will be maintained until the Work is complete, as set forth in Paragraph 15.06.D.

C. *Property Insurance for Substantially Complete Facilities*: Promptly after Substantial Completion, and before actual occupancy or use of the substantially completed Work, Owner will obtain property insurance for such substantially completed Work, and maintain such property insurance at least until the Work is complete, as set forth in Paragraph 15.06.D. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, and provide coverage consistent with that required for the builder's risk insurance. The builder's risk insurance may terminate upon written confirmation of Owner's procurement of such property insurance.

D. *Partial Occupancy or Use by Owner*: If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work, as provided in Paragraph 15.04, then Owner (directly, if it is the purchaser of the builder's risk policy, or through Contractor) will

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provide advance notice of such occupancy or use to the builder's risk insurer, and obtain an endorsement consenting to the continuation of coverage prior to commencing such partial occupancy or use.

E. *Insurance of Other Property; Additional Insurance*: If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, then the entity or individual owning such property item will be responsible for insuring it. If Contractor elects to obtain other special insurance to be included in or supplement the builder's risk or property insurance policies provided under this Paragraph 6.04, it may do so at Contractor's expense.

6.05 *Property Losses; Subrogation*

A. The builder's risk insurance policy purchased and maintained in accordance with Paragraph 6.04 (or an installation floater policy if authorized by the Supplementary Conditions), will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors.

1. Owner and Contractor waive all rights against each other and the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from any of the perils, risks, or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Engineer, its consultants, all individuals or entities identified in the Supplementary Conditions as builder's risk or installation floater insureds, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, under such policies for losses and damages so caused.

2. None of the above waivers extends to the rights that any party making such waiver may have to the proceeds of insurance held by Owner or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.

B. Any property insurance policy maintained by Owner covering any loss, damage, or consequential loss to Owner's existing structures, buildings, or facilities in which any part of the Work will occur, or to which any part of the Work will attach or adjoin; to adjacent structures, buildings, or facilities of Owner; or to part or all of the completed or substantially completed Work, during partial occupancy or use pursuant to Paragraph 15.04, after Substantial Completion pursuant to Paragraph 15.03, or after final payment pursuant to Paragraph 15.06, will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them, and that the insured is allowed to waive the insurer's rights of subrogation in a written contract executed prior to the loss, damage, or consequential loss.

1. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from fire or any of the perils, risks, or causes of loss covered by such policies.

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C. The waivers in this Paragraph 6.05 include the waiver of rights due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other insured peril, risk, or cause of loss.

D. Contractor shall be responsible for assuring that each Subcontract contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in the Supplementary Conditions as insureds, the Engineer and its consultants, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, relating to, or resulting from fire or other peril, risk, or cause of loss covered by builder's risk insurance, installation floater, and any other property insurance applicable to the Work.

6.06 *Receipt and Application of Property Insurance Proceeds*

A. Any insured loss under the builder's risk and other policies of property insurance required by Paragraph 6.04 will be adjusted and settled with the named insured that purchased the policy. Such named insured shall act as fiduciary for the other insureds, and give notice to such other insureds that adjustment and settlement of a claim is in progress. Any other insured may state its position regarding a claim for insured loss in writing within 15 days after notice of such claim.

B. Proceeds for such insured losses may be made payable by the insurer either jointly to multiple insureds, or to the named insured that purchased the policy in its own right and as fiduciary for other insureds, subject to the requirements of any applicable mortgage clause. A named insured receiving insurance proceeds under the builder's risk and other policies of insurance required by Paragraph 6.04 shall maintain such proceeds in a segregated account, and distribute such proceeds in accordance with such agreement as the parties in interest may reach, or as otherwise required under the dispute resolution provisions of this Contract or applicable Laws and Regulations.

C. If no other special agreement is reached, Contractor shall repair or replace the damaged Work, using allocated insurance proceeds.

ARTICLE 7—CONTRACTOR'S RESPONSIBILITIES

7.01 *Contractor's Means and Methods of Construction*

A. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.

B. If the Contract Documents note, or Contractor determines, that professional engineering or other design services are needed to carry out Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures, or for Site safety, then Contractor shall cause such services to be provided by a properly licensed design professional, at Contractor's expense. Such services are not Owner-delegated professional design services under this Contract, and neither Owner nor Engineer has any responsibility with respect to (1) Contractor's determination of the need for such services, (2) the qualifications or licensing of the design professionals retained or employed by Contractor, (3) the performance of such services, or (4) any errors, omissions, or defects in such services.

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7.02 *Supervision and Superintendence*

A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents.

B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who will not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

7.03 *Labor; Working Hours*

A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall maintain good discipline and order at the Site.

B. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of Contractor's employees; of Suppliers and Subcontractors, and their employees; and of any other individuals or entities performing or furnishing any of the Work, just as Contractor is responsible for Contractor's own acts and omissions.

C. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site will be performed during regular working hours, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld.

7.04 *Services, Materials, and Equipment*

A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start up, and completion of the Work, whether or not such items are specifically called for in the Contract Documents.

B. All materials and equipment incorporated into the Work must be new and of good quality, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications will expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.

C. All materials and equipment must be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

7.05 *"Or Equals"*

A. *Contractor's Request; Governing Criteria*: Whenever an item of equipment or material is specified or described in the Contract Documents by using the names of one or more proprietary items or specific Suppliers, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless the specification or

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description contains or is followed by words reading that no like, equivalent, or "or equal" item is permitted, Contractor may request that Engineer authorize the use of other items of equipment or material, or items from other proposed Suppliers, under the circumstances described below.

1. If Engineer in its sole discretion determines that an item of equipment or material proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer will deem it an "or equal" item. For the purposes of this paragraph, a proposed item of equipment or material will be considered functionally equal to an item so named if:

    a. in the exercise of reasonable judgment Engineer determines that the proposed item:

        1) is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

        2) will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;

        3) has a proven record of performance and availability of responsive service; and

        4) is not objectionable to Owner.

    b. Contractor certifies that, if the proposed item is approved and incorporated into the Work:

        1) there will be no increase in cost to the Owner or increase in Contract Times; and

        2) the item will conform substantially to the detailed requirements of the item named in the Contract Documents.

B. *Contractor's Expense*: Contractor shall provide all data in support of any proposed "or equal" item at Contractor's expense.

C. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each "or-equal" request. Engineer may require Contractor to furnish additional data about the proposed "or-equal" item. Engineer will be the sole judge of acceptability. No "or-equal" item will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an "or-equal," which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.

D. *Effect of Engineer's Determination*: Neither approval nor denial of an "or-equal" request will result in any change in Contract Price. The Engineer's denial of an "or-equal" request will be final and binding, and may not be reversed through an appeal under any provision of the Contract.

E. *Treatment as a Substitution Request*: If Engineer determines that an item of equipment or material proposed by Contractor does not qualify as an "or-equal" item, Contractor may request that Engineer consider the item a proposed substitute pursuant to Paragraph 7.06.

7.06 *Substitutes*

A. *Contractor's Request; Governing Criteria*: Unless the specification or description of an item of equipment or material required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that

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Engineer authorize the use of other items of equipment or material under the circumstances described below. To the extent possible such requests must be made before commencement of related construction at the Site.

1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of equipment or material from anyone other than Contractor.
2. The requirements for review by Engineer will be as set forth in Paragraph 7.06.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.
3. Contractor shall make written application to Engineer for review of a proposed substitute item of equipment or material that Contractor seeks to furnish or use. The application:
    a. will certify that the proposed substitute item will:
        1) perform adequately the functions and achieve the results called for by the general design;
        2) be similar in substance to the item specified; and
        3) be suited to the same use as the item specified.
    b. will state:
        1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times;
        2) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item; and
        3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.
    c. will identify:
        1) all variations of the proposed substitute item from the item specified; and
        2) available engineering, sales, maintenance, repair, and replacement services.
    d. will contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.

B. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be evidenced by a

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Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.

C. *Special Guarantee*: Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.

D. *Reimbursement of Engineer's Cost*: Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.

E. *Contractor's Expense*: Contractor shall provide all data in support of any proposed substitute at Contractor's expense.

F. *Effect of Engineer's Determination*: If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request will be final and binding, and may not be reversed through an appeal under any provision of the Contract. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.06.D, by timely submittal of a Change Proposal.

7.07 *Concerning Subcontractors and Suppliers*

A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner. The Contractor's retention of a Subcontractor or Supplier for the performance of parts of the Work will not relieve Contractor's obligation to Owner to perform and complete the Work in accordance with the Contract Documents.

B. Contractor shall retain specific Subcontractors and Suppliers for the performance of designated parts of the Work if required by the Contract to do so.

C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor or Supplier to furnish or perform any of the Work against which Contractor has reasonable objection.

D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within 5 days.

E. Owner may require the replacement of any Subcontractor or Supplier. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors or Suppliers for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor or Supplier so identified solely on the basis of substantive, reasonable objection after due investigation.

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Contractor shall submit an acceptable replacement for the rejected Subcontractor or Supplier.

F. If Owner requires the replacement of any Subcontractor or Supplier retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, with respect to the replacement; and Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.

G. No acceptance by Owner of any such Subcontractor or Supplier, whether initially or as a replacement, will constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.

H. On a monthly basis, Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.

I. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors and Suppliers.

J. The divisions and sections of the Specifications and the identifications of any Drawings do not control Contractor in dividing the Work among Subcontractors or Suppliers, or in delineating the Work to be performed by any specific trade.

K. All Work performed for Contractor by a Subcontractor or Supplier must be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract for the benefit of Owner and Engineer.

L. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor for Work performed for Contractor by the Subcontractor or Supplier.

M. Contractor shall restrict all Subcontractors and Suppliers from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed in this Contract.

7.08 *Patent Fees and Royalties*

A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If an invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights will be disclosed in the Contract Documents.

B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as

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being subject to payment of any license fee or royalty to others required by patent rights or copyrights.

C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

7.09 *Permits*

A. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all construction permits, licenses, and certificates of occupancy. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of the submission of Contractor's Bid (or when Contractor became bound under a negotiated contract). Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

7.10 *Taxes*

A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

7.11 *Laws and Regulations*

A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.

B. If Contractor performs any Work or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses, and shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work or other action. It is not Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this does not relieve Contractor of its obligations under Paragraph 3.03.

C. Owner or Contractor may give written notice to the other party of any changes after the submission of Contractor's Bid (or after the date when Contractor became bound under a negotiated contract) in Laws or Regulations having an effect on the cost or time of performance of the Work, including but not limited to changes in Laws or Regulations having an effect on procuring permits and on sales, use, value-added, consumption, and other similar taxes. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times resulting from such

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changes, then within 30 days of such written notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

7.12 *Record Documents*

A. Contractor shall maintain in a safe place at the Site one printed record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, written interpretations and clarifications, and approved Shop Drawings. Contractor shall keep such record documents in good order and annotate them to show changes made during construction. These record documents, together with all approved Samples, will be available to Engineer for reference. Upon completion of the Work, Contractor shall deliver these record documents to Engineer.

7.13 *Safety and Protection*

A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations.

B. Contractor shall designate a qualified and experienced safety representative whose duties and responsibilities are the prevention of Work-related accidents and the maintenance and supervision of safety precautions and programs.

C. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:

1. all persons on the Site or who may be affected by the Work;

2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and

3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.

D. All damage, injury, or loss to any property referred to in Paragraph 7.13.C.2 or 7.13.C.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).

E. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection.

F. Contractor shall notify Owner; the owners of adjacent property; the owners of Underground Facilities and other utilities (if the identity of such owners is known to Contractor); and other contractors and utility owners performing work at or adjacent to the Site, in writing, when

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Contractor knows that prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.

G. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. Any Owner's safety programs that are applicable to the Work are identified or included in the Supplementary Conditions or Specifications.

H. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.

I. Contractor's duties and responsibilities for safety and protection will continue until all the Work is completed, Engineer has issued a written notice to Owner and Contractor in accordance with Paragraph 15.06.C that the Work is acceptable, and Contractor has left the Site (except as otherwise expressly provided in connection with Substantial Completion).

J. Contractor's duties and responsibilities for safety and protection will resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

7.14 *Hazard Communication Programs*

A. Contractor shall be responsible for coordinating any exchange of safety data sheets (formerly known as material safety data sheets) or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

7.15 *Emergencies*

A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused by an emergency, or are required as a result of Contractor's response to an emergency. If Engineer determines that a change in the Contract Documents is required because of an emergency or Contractor's response, a Work Change Directive or Change Order will be issued.

7.16 *Submittals*

A. *Shop Drawing and Sample Requirements*

1. Before submitting a Shop Drawing or Sample, Contractor shall:

a. review and coordinate the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;

b. determine and verify:

1) all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect to the Submittal;

2) the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and

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3) all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto;

c. confirm that the Submittal is complete with respect to all related data included in the Submittal.

2. Each Shop Drawing or Sample must bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that Submittal, and that Contractor approves the Submittal.

3. With each Shop Drawing or Sample, Contractor shall give Engineer specific written notice of any variations that the Submittal may have from the requirements of the Contract Documents. This notice must be set forth in a written communication separate from the Submittal; and, in addition, in the case of a Shop Drawing by a specific notation made on the Shop Drawing itself.

B. *Submittal Procedures for Shop Drawings and Samples*: Contractor shall label and submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals.

1. *Shop Drawings*

a. Contractor shall submit the number of copies required in the Specifications.

b. Data shown on the Shop Drawings must be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide, and to enable Engineer to review the information for the limited purposes required by Paragraph 7.16.C.

2. *Samples*

a. Contractor shall submit the number of Samples required in the Specifications.

b. Contractor shall clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the Submittal for the limited purposes required by Paragraph 7.16.C.

3. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.

C. *Engineer's Review of Shop Drawings and Samples*

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the accepted Schedule of Submittals. Engineer's review and approval will be only to determine if the items covered by the Submittals will, after installation or incorporation in the Work, comply with the requirements of the Contract Documents, and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

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2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction, or to safety precautions or programs incident thereto.

3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

4. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 7.16.A.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer will document any such approved variation from the requirements of the Contract Documents in a Field Order or other appropriate Contract modification.

5. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for complying with the requirements of Paragraphs 7.16.A and B.

6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, will not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.

7. Neither Engineer's receipt, review, acceptance, or approval of a Shop Drawing or Sample will result in such item becoming a Contract Document.

8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.C.4.

D. *Resubmittal Procedures for Shop Drawings and Samples*

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous Submittals.

2. Contractor shall furnish required Shop Drawing and Sample submittals with sufficient information and accuracy to obtain required approval of an item with no more than two resubmittals. Engineer will record Engineer's time for reviewing a third or subsequent resubmittal of a Shop Drawing or Sample, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due Contractor to secure reimbursement for such charges.

3. If Contractor requests a change of a previously approved Shop Drawing or Sample, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

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E. *Submittals Other than Shop Drawings, Samples, and Owner-Delegated Designs*

1. The following provisions apply to all Submittals other than Shop Drawings, Samples, and Owner-delegated designs:

a. Contractor shall submit all such Submittals to the Engineer in accordance with the Schedule of Submittals and pursuant to the applicable terms of the Contract Documents.

b. Engineer will provide timely review of all such Submittals in accordance with the Schedule of Submittals and return such Submittals with a notation of either Accepted or Not Accepted. Any such Submittal that is not returned within the time established in the Schedule of Submittals will be deemed accepted.

c. Engineer's review will be only to determine if the Submittal is acceptable under the requirements of the Contract Documents as to general form and content of the Submittal.

d. If any such Submittal is not accepted, Contractor shall confer with Engineer regarding the reason for the non-acceptance, and resubmit an acceptable document.

2. Procedures for the submittal and acceptance of the Progress Schedule, the Schedule of Submittals, and the Schedule of Values are set forth in Paragraphs 2.03. 2.04, and 2.05.

F. Owner-delegated Designs: Submittals pursuant to Owner-delegated designs are governed by the provisions of Paragraph 7.19.

7.17 *Contractor's General Warranty and Guarantee*

A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer is entitled to rely on Contractor's warranty and guarantee.

B. Owner's rights under this warranty and guarantee are in addition to, and are not limited by, Owner's rights under the correction period provisions of Paragraph 15.08. The time in which Owner may enforce its warranty and guarantee rights under this Paragraph 7.17 is limited only by applicable Laws and Regulations restricting actions to enforce such rights; provided, however, that after the end of the correction period under Paragraph 15.08:

1. Owner shall give Contractor written notice of any defective Work within 60 days of the discovery that such Work is defective; and

2. Such notice will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the notice.

C. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:

1. abuse, or improper modification, maintenance, or operation, by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or

2. normal wear and tear under normal usage.

D. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents is absolute. None of the following will constitute an acceptance of Work that is

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not in accordance with the Contract Documents, a release of Contractor's obligation to perform the Work in accordance with the Contract Documents, or a release of Owner's warranty and guarantee rights under this Paragraph 7.17:

1. Observations by Engineer;
2. Recommendation by Engineer or payment by Owner of any progress or final payment;
3. The issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
4. Use or occupancy of the Work or any part thereof by Owner;
5. Any review and approval of a Shop Drawing or Sample submittal;
6. The issuance of a notice of acceptability by Engineer;
7. The end of the correction period established in Paragraph 15.08;
8. Any inspection, test, or approval by others; or
9. Any correction of defective Work by Owner.

E. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract will govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.

7.18 *Indemnification*

A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from losses, damages, costs, and judgments (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising from third-party claims or actions relating to or resulting from the performance or furnishing of the Work, provided that any such claim, action, loss, cost, judgment or damage is attributable to bodily injury, sickness, disease, or death, or to damage to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom, but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable.

B. In any and all claims against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 7.18.A will not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

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7.19 *Delegation of Professional Design Services*

A. Owner may require Contractor to provide professional design services for a portion of the Work by express delegation in the Contract Documents. Such delegation will specify the performance and design criteria that such services must satisfy, and the Submittals that Contractor must furnish to Engineer with respect to the Owner-delegated design.

B. Contractor shall cause such Owner-delegated professional design services to be provided pursuant to the professional standard of care by a properly licensed design professional, whose signature and seal must appear on all drawings, calculations, specifications, certifications, and Submittals prepared by such design professional. Such design professional must issue all certifications of design required by Laws and Regulations.

C. If a Shop Drawing or other Submittal related to the Owner-delegated design is prepared by Contractor, a Subcontractor, or others for submittal to Engineer, then such Shop Drawing or other Submittal must bear the written approval of Contractor's design professional when submitted by Contractor to Engineer.

D. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, and approvals performed or provided by the design professionals retained or employed by Contractor under an Owner-delegated design, subject to the professional standard of care and the performance and design criteria stated in the Contract Documents.

E. Pursuant to this Paragraph 7.19, Engineer's review, approval, and other determinations regarding design drawings, calculations, specifications, certifications, and other Submittals furnished by Contractor pursuant to an Owner-delegated design will be only for the following limited purposes:

1. Checking for conformance with the requirements of this Paragraph 7.19;

2. Confirming that Contractor (through its design professionals) has used the performance and design criteria specified in the Contract Documents; and

3. Establishing that the design furnished by Contractor is consistent with the design concept expressed in the Contract Documents.

F. Contractor shall not be responsible for the adequacy of performance or design criteria specified by Owner or Engineer.

G. Contractor is not required to provide professional services in violation of applicable Laws and Regulations.

ARTICLE 8—OTHER WORK AT THE SITE

8.01 *Other Work*

A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.

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B. If Owner performs other work at or adjacent to the Site with Owner's employees, or through contracts for such other work, then Owner shall give Contractor written notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any third-party utility work that Owner has arranged to take place at or adjacent to the Site, Owner shall provide such information to Contractor.

C. Contractor shall afford proper and safe access to the Site to each contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work.

D. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected.

E. If the proper execution or results of any part of Contractor's Work depends upon work performed by others, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

F. The provisions of this article are not applicable to work that is performed by third-party utilities or other third-party entities without a contract with Owner, or that is performed without having been arranged by Owner. If such work occurs, then any related delay, disruption, or interference incurred by Contractor is governed by the provisions of Paragraph 4.05.C.3.

8.02 *Coordination*

A. If Owner intends to contract with others for the performance of other work at or adjacent to the Site, to perform other work at or adjacent to the Site with Owner's employees, or to arrange to have utility owners perform work at or adjacent to the Site, the following will be set forth in the Supplementary Conditions or provided to Contractor prior to the start of any such other work:

1. The identity of the individual or entity that will have authority and responsibility for coordination of the activities among the various contractors;

2. An itemization of the specific matters to be covered by such authority and responsibility; and

3. The extent of such authority and responsibilities.

B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

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8.03 *Legal Relationships*

A. If, in the course of performing other work for Owner at or adjacent to the Site, the Owner's employees, any other contractor working for Owner, or any utility owner that Owner has arranged to perform work, causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times. Contractor must submit any Change Proposal seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment will take into account information (if any) regarding such other work that was provided to Contractor in the Contract Documents prior to the submittal of the Bid or the final negotiation of the terms of the Contract, and any remedies available to Contractor under Laws or Regulations concerning utility action or inaction. When applicable, any such equitable adjustment in Contract Price will be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times or Contract Price is subject to the provisions of Paragraphs 4.05.D and 4.05.E.

B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site.

   1. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due Contractor, and assign to such other contractor or utility owner the Owner's contractual rights against Contractor with respect to the breach of the obligations set forth in this Paragraph 8.03.B.

   2. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due Contractor.

C. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claims, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or

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arbitration or other dispute resolution costs) arising out of or relating to such damage, delay, disruption, or interference.

ARTICLE 9—OWNER'S RESPONSIBILITIES

9.01 *Communications to Contractor*

A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

9.02 *Replacement of Engineer*

A. Owner may at its discretion appoint an engineer to replace Engineer, provided Contractor makes no reasonable objection to the replacement engineer. The replacement engineer's status under the Contract Documents will be that of the former Engineer.

9.03 *Furnish Data*

A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

9.04 *Pay When Due*

A. Owner shall make payments to Contractor when they are due as provided in the Agreement.

9.05 *Lands and Easements; Reports, Tests, and Drawings*

A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.

B. Owner's duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.

C. Article 5 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

9.06 *Insurance*

A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 6.

9.07 *Change Orders*

A. Owner's responsibilities with respect to Change Orders are set forth in Article 11.

9.08 *Inspections, Tests, and Approvals*

A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 14.02.B.

9.09 *Limitations on Owner's Responsibilities*

A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

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9.10 *Undisclosed Hazardous Environmental Condition*

A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.

9.11 *Evidence of Financial Arrangements*

A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract (including obligations under proposed changes in the Work).

9.12 *Safety Programs*

A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed.

B. Owner shall furnish copies of any applicable Owner safety programs to Contractor.

ARTICLE 10—ENGINEER'S STATUS DURING CONSTRUCTION

10.01 *Owner's Representative*

A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract.

10.02 *Visits to Site*

A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe, as an experienced and qualified design professional, the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.

B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 10.07. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

10.03 *Resident Project Representative*

A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in the Supplementary Conditions, and limitations on the

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responsibilities thereof will be as provided in the Supplementary Conditions and in Paragraph 10.07.

B. If Owner designates an individual or entity who is not Engineer's consultant, agent, or employee to represent Owner at the Site, then the responsibilities and authority of such individual or entity will be as provided in the Supplementary Conditions.

10.04 *Engineer's Authority*

A. Engineer has the authority to reject Work in accordance with Article 14.

B. Engineer's authority as to Submittals is set forth in Paragraph 7.16.

C. Engineer's authority as to design drawings, calculations, specifications, certifications and other Submittals from Contractor in response to Owner's delegation (if any) to Contractor of professional design services, is set forth in Paragraph 7.19.

D. Engineer's authority as to changes in the Work is set forth in Article 11.

E. Engineer's authority as to Applications for Payment is set forth in Article 15.

10.05 *Determinations for Unit Price Work*

A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor as set forth in Paragraph 13.03.

10.06 *Decisions on Requirements of Contract Documents and Acceptability of Work*

A. Engineer will render decisions regarding the requirements of the Contract Documents, and judge the acceptability of the Work, pursuant to the specific procedures set forth herein for initial interpretations, Change Proposals, and acceptance of the Work. In rendering such decisions and judgments, Engineer will not show partiality to Owner or Contractor, and will not be liable to Owner, Contractor, or others in connection with any proceedings, interpretations, decisions, or judgments conducted or rendered in good faith.

10.07 *Limitations on Engineer's Authority and Responsibilities*

A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer, will create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.

D. Engineer's review of the final Application for Payment and accompanying documentation, and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of

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inspection, tests and approvals, and other documentation required to be delivered by Contractor under Paragraph 15.06.A, will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals, that the results certified indicate compliance with the Contract Documents.

E. The limitations upon authority and responsibility set forth in this Paragraph 10.07 also apply to the Resident Project Representative, if any.

10.08 *Compliance with Safety Program*

A. While at the Site, Engineer's employees and representatives will comply with the specific applicable requirements of Owner's and Contractor's safety programs of which Engineer has been informed.

ARTICLE 11—CHANGES TO THE CONTRACT

11.01 *Amending and Supplementing the Contract*

A. The Contract may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.

B. If an amendment or supplement to the Contract includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order.

C. All changes to the Contract that involve (1) the performance or acceptability of the Work, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, must be supported by Engineer's recommendation. Owner and Contractor may amend other terms and conditions of the Contract without the recommendation of the Engineer.

11.02 *Change Orders*

A. Owner and Contractor shall execute appropriate Change Orders covering:

1. Changes in Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive;

2. Changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;

3. Changes in the Work which are: (a) ordered by Owner pursuant to Paragraph 11.05, (b) required because of Owner's acceptance of defective Work under Paragraph 14.04 or Owner's correction of defective Work under Paragraph 14.07, or (c) agreed to by the parties, subject to the need for Engineer's recommendation if the change in the Work involves the design (as set forth in the Drawings, Specifications, or otherwise) or other engineering or technical matters; and

4. Changes that embody the substance of any final and binding results under: Paragraph 11.03.B, resolving the impact of a Work Change Directive; Paragraph 11.09, concerning Change Proposals; Article 12, Claims; Paragraph 13.02.D, final adjustments resulting from allowances; Paragraph 13.03.D, final adjustments relating to determination of quantities for Unit Price Work; and similar provisions.

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B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of Paragraph 11.02.A, it will be deemed to be of full force and effect, as if fully executed.

11.03 *Work Change Directives*

A. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including Paragraph 11.07 regarding change of Contract Price.

B. If Owner has issued a Work Change Directive and:

1. Contractor believes that an adjustment in Contract Times or Contract Price is necessary, then Contractor shall submit any Change Proposal seeking such an adjustment no later than 30 days after the completion of the Work set out in the Work Change Directive.

2. Owner believes that an adjustment in Contract Times or Contract Price is necessary, then Owner shall submit any Claim seeking such an adjustment no later than 60 days after issuance of the Work Change Directive.

11.04 *Field Orders*

A. Engineer may authorize minor changes in the Work if the changes do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Such changes will be accomplished by a Field Order and will be binding on Owner and also on Contractor, which shall perform the Work involved promptly.

B. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

11.05 *Owner-Authorized Changes in the Work*

A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work. Changes involving the design (as set forth in the Drawings, Specifications, or otherwise) or other engineering or technical matters will be supported by Engineer's recommendation.

B. Such changes in the Work may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price; or by a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Added or revised Work must be performed under the applicable conditions of the Contract Documents.

C. Nothing in this Paragraph 11.05 obligates Contractor to undertake work that Contractor reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under the Contract Documents or Laws and Regulations.

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11.06 *Unauthorized Changes in the Work*

A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents, as amended, modified, or supplemented, except in the case of an emergency as provided in Paragraph 7.15 or in the case of uncovering Work as provided in Paragraph 14.05.C.2.

11.07 *Change of Contract Price*

A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment of Contract Price must comply with the provisions of Article 12.

B. An adjustment in the Contract Price will be determined as follows:

1. Where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03);

2. Where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.07.C.2); or

3. Where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on the basis of the Cost of the Work (determined as provided in Paragraph 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.07.C).

C. *Contractor's Fee*: When applicable, the Contractor's fee for overhead and profit will be determined as follows:

1. A mutually acceptable fixed fee; or

2. If a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:

a. For costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2, the Contractor's fee will be 15 percent;

b. For costs incurred under Paragraph 13.01.B.3, the Contractor's fee will be 5 percent;

c. Where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 11.07.C.2.a and 11.07.C.2.b is that the Contractor's fee will be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of 5 percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted Work the maximum total fee to be paid by Owner will be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the Work;

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d. No fee will be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;

e. The amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in Cost of the Work will be the amount of the actual net decrease in Cost of the Work and a deduction of an additional amount equal to 5 percent of such actual net decrease in Cost of the Work; and

f. When both additions and credits are involved in any one change or Change Proposal, the adjustment in Contractor's fee will be computed by determining the sum of the costs in each of the cost categories in Paragraph 13.01.B (specifically, payroll costs, Paragraph 13.01.B.1; incorporated materials and equipment costs, Paragraph 13.01.B.2; Subcontract costs, Paragraph 13.01.B.3; special consultants costs, Paragraph 13.01.B.4; and other costs, Paragraph 13.01.B.5) and applying to each such cost category sum the appropriate fee from Paragraphs 11.07.C.2.a through 11.07.C.2.e, inclusive.

11.08 *Change of Contract Times*

A. The Contract Times may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Times must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment in the Contract Times must comply with the provisions of Article 12.

B. Delay, disruption, and interference in the Work, and any related changes in Contract Times, are addressed in and governed by Paragraph 4.05.

11.09 *Change Proposals*

A. *Purpose and Content*: Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; contest an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; challenge a set-off against payment due; or seek other relief under the Contract. The Change Proposal will specify any proposed change in Contract Times or Contract Price, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents. Each Change Proposal will address only one issue, or a set of closely related issues.

B. *Change Proposal Procedures*

1. *Submittal*: Contractor shall submit each Change Proposal to Engineer within 30 days after the start of the event giving rise thereto, or after such initial decision.

2. *Supporting Data*: The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal.

a. Change Proposals based on or related to delay, interruption, or interference must comply with the provisions of Paragraphs 4.05.D and 4.05.E.

b. Change proposals related to a change of Contract Price must include full and detailed accounts of materials incorporated into the Work and labor and equipment used for the subject Work.

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The supporting data must be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event.

3. *Engineer's Initial Review*: Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal. If in its discretion Engineer concludes that additional supporting data is needed before conducting a full review and making a decision regarding the Change Proposal, then Engineer may request that Contractor submit such additional supporting data by a date specified by Engineer, prior to Engineer beginning its full review of the Change Proposal.

4. *Engineer's Full Review and Action on the Change Proposal*: Upon receipt of Contractor's supporting data (including any additional data requested by Engineer), Engineer will conduct a full review of each Change Proposal and, within 30 days after such receipt of the Contractor's supporting data, either approve the Change Proposal in whole, deny it in whole, or approve it in part and deny it in part. Such actions must be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.

5. *Binding Decision*: Engineer's decision is final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.

C. *Resolution of Certain Change Proposals*: If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then Engineer will notify the parties in writing that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice will be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.

D. *Post-Completion*: Contractor shall not submit any Change Proposals after Engineer issues a written recommendation of final payment pursuant to Paragraph 15.06.B.

11.10 *Notification to Surety*

A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

ARTICLE 12—CLAIMS

12.01 *Claims*

A. *Claims Process*: The following disputes between Owner and Contractor are subject to the Claims process set forth in this article:

1. Appeals by Owner or Contractor of Engineer's decisions regarding Change Proposals;

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2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents;

3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters; and

4. Subject to the waiver provisions of Paragraph 15.07, any dispute arising after Engineer has issued a written recommendation of final payment pursuant to Paragraph 15.06.B.

B. *Submittal of Claim*: The party submitting a Claim shall deliver it directly to the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The party submitting the Claim shall also furnish a copy to the Engineer, for its information only. The responsibility to substantiate a Claim rests with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor's knowledge and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.

C. *Review and Resolution*: The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim will be stated in writing and submitted to the other party, with a copy to Engineer.

D. *Mediation*

1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate will stay the Claim submittal and response process.

2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process will resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim submittal and decision process will resume as of the date of the conclusion of the mediation, as determined by the mediator.

3. Owner and Contractor shall each pay one-half of the mediator's fees and costs.

E. *Partial Approval*: If the party receiving a Claim approves the Claim in part and denies it in part, such action will be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.

F. *Denial of Claim*: If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim will be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of disputes.

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G. *Final and Binding Results*: If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim will be incorporated in a Change Order or other written document to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

ARTICLE 13—COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

13.01 *Cost of the Work*

A. *Purposes for Determination of Cost of the Work*: The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:

1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or

2. When needed to determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.

B. *Costs Included*: Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work will be in amounts no higher than those commonly incurred in the locality of the Project, will not include any of the costs itemized in Paragraph 13.01.C, and will include only the following items:

1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor in advance of the subject Work. Such employees include, without limitation, superintendents, foremen, safety managers, safety representatives, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work will be apportioned on the basis of their time spent on the Work. Payroll costs include, but are not limited to, salaries and wages plus the cost of fringe benefits, which include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, sick leave, and vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, will be included in the above to the extent authorized by Owner.

2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts will accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment will accrue to Owner, and Contractor shall make provisions so that they may be obtained.

3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors

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acceptable to Owner and Contractor and shall deliver such bids to Owner, which will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee will be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 13.01.

4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed or retained for services specifically related to the Work.

5. Other costs consisting of the following:

    a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.

    b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.

        1) In establishing included costs for materials such as scaffolding, plating, or sheeting, consideration will be given to the actual or the estimated life of the material for use on other projects; or rental rates may be established on the basis of purchase or salvage value of such items, whichever is less. Contractor will not be eligible for compensation for such items in an amount that exceeds the purchase cost of such item.

    c. *Construction Equipment Rental*

        1) Rentals of all construction equipment and machinery, and the parts thereof, in accordance with rental agreements approved by Owner as to price (including any surcharge or special rates applicable to overtime use of the construction equipment or machinery), and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs will be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts must cease when the use thereof is no longer necessary for the Work.

        2) Costs for equipment and machinery owned by Contractor or a Contractor-related entity will be paid at a rate shown for such equipment in the equipment rental rate book specified in the Supplementary Conditions. An hourly rate will be computed by dividing the monthly rates by 176. These computed rates will include all operating costs.

        3) With respect to Work that is the result of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price ("changed Work"), included costs will be based on the time the equipment or machinery is in use on the changed Work and the costs of transportation, loading, unloading, assembly, dismantling, and removal when directly attributable to the changed Work. The cost of any such equipment or machinery, or parts thereof, must cease to accrue when the use thereof is no longer necessary for the changed Work.

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d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.

e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of builder's risk or other property insurance established in accordance with Paragraph 6.04), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses will be included in the Cost of the Work for the purpose of determining Contractor's fee.

g. The cost of utilities, fuel, and sanitary facilities at the Site.

h. Minor expenses such as communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.

i. The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.

C. *Costs Excluded*: The term Cost of the Work does not include any of the following items:

1. Payroll costs and other compensation of Contractor's officers, executives, principals, general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expediters, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.

2. The cost of purchasing, renting, or furnishing small tools and hand tools.

3. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.

4. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.

5. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.

6. Expenses incurred in preparing and advancing Claims.

7. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 13.01.B.

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D. *Contractor's Fee*

1. When the Work as a whole is performed on the basis of cost-plus-a-fee, then:

a. Contractor's fee for the Work set forth in the Contract Documents as of the Effective Date of the Contract will be determined as set forth in the Agreement.

b. for any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work, Contractor's fee will be determined as follows:

1) When the fee for the Work as a whole is a percentage of the Cost of the Work, the fee will automatically adjust as the Cost of the Work changes.

2) When the fee for the Work as a whole is a fixed fee, the fee for any additions or deletions will be determined in accordance with Paragraph 11.07.C.2.

2. When the Work as a whole is performed on the basis of a stipulated sum, or any other basis other than cost-plus-a-fee, then Contractor's fee for any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work will be determined in accordance with Paragraph 11.07.C.2.

E. *Documentation and Audit*: Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor and pertinent Subcontractors will establish and maintain records of the costs in accordance with generally accepted accounting practices. Subject to prior written notice, Owner will be afforded reasonable access, during normal business hours, to all Contractor's accounts, records, books, correspondence, instructions, drawings, receipts, vouchers, memoranda, and similar data relating to the Cost of the Work and Contractor's fee. Contractor shall preserve all such documents for a period of three years after the final payment by Owner. Pertinent Subcontractors will afford such access to Owner, and preserve such documents, to the same extent required of Contractor.

13.02 *Allowances*

A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.

B. *Cash Allowances*: Contractor agrees that:

1. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and

2. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment for any of the foregoing will be valid.

C. *Owner's Contingency Allowance*: Contractor agrees that an Owner's contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.

D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor for Work covered by allowances, and the Contract Price will be correspondingly adjusted.

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13.03 *Unit Price Work*

A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.

B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities.

C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.

D. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, and the final adjustment of Contract Price will be set forth in a Change Order, subject to the provisions of the following paragraph.

E. *Adjustments in Unit Price*

1. Contractor or Owner shall be entitled to an adjustment in the unit price with respect to an item of Unit Price Work if:

    a. the quantity of the item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and

    b. Contractor's unit costs to perform the item of Unit Price Work have changed materially and significantly as a result of the quantity change.

2. The adjustment in unit price will account for and be coordinated with any related changes in quantities of other items of Work, and in Contractor's costs to perform such other Work, such that the resulting overall change in Contract Price is equitable to Owner and Contractor.

3. Adjusted unit prices will apply to all units of that item.

ARTICLE 14—TESTS AND INSPECTIONS; CORRECTION, REMOVAL, OR ACCEPTANCE OF DEFECTIVE WORK

14.01 *Access to Work*

A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and authorities having jurisdiction have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply with such procedures and programs as applicable.

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14.02 *Tests, Inspections, and Approvals*

A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.

B. Owner shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform all inspections and tests expressly required by the Contract Documents to be furnished and paid for by Owner, except that costs incurred in connection with tests or inspections of covered Work will be governed by the provisions of Paragraph 14.05.

C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.

D. Contractor shall be responsible for arranging, obtaining, and paying for all inspections and tests required:

1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;

2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;

3. by manufacturers of equipment furnished under the Contract Documents;

4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and

5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

Such inspections and tests will be performed by independent inspectors, testing laboratories, or other qualified individuals or entities acceptable to Owner and Engineer.

E. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.

F. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation. Such uncovering will be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to cover the same and Engineer had not acted with reasonable promptness in response to such notice.

14.03 *Defective Work*

A. *Contractor's Obligation*: It is Contractor's obligation to assure that the Work is not defective.

B. *Engineer's Authority*: Engineer has the authority to determine whether Work is defective, and to reject defective Work.

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C. *Notice of Defects*: Prompt written notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.

D. *Correction, or Removal and Replacement*: Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.

E. *Preservation of Warranties*: When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

F. *Costs and Damages*: In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective Work. Prior to final payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs, losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

14.04 *Acceptance of Defective Work*

A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so (subject, if such acceptance occurs prior to final payment, to Engineer's confirmation that such acceptance is in general accord with the design intent and applicable engineering principles, and will not endanger public safety). Contractor shall pay all claims, costs, losses, and damages attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness), and for the diminished value of the Work to the extent not otherwise paid by Contractor. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work will be incorporated in a Change Order. If the parties are unable to agree as to the decrease in the Contract Price, reflecting the diminished value of Work so accepted, then Owner may impose a reasonable set-off against payments due under Article 15. If the acceptance of defective Work occurs after final payment, Contractor shall pay an appropriate amount to Owner.

14.05 *Uncovering Work*

A. Engineer has the authority to require additional inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.

B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.

C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, and provide all necessary labor, material, and equipment.

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1. If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and pending Contractor's full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 15.

2. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, then Contractor may submit a Change Proposal within 30 days of the determination that the Work is not defective.

14.06 *Owner May Stop the Work*

A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, then Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work will not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

14.07 *Owner May Correct Defective Work*

A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace defective Work as required by Engineer, then Owner may, after 7 days' written notice to Contractor, correct or remedy any such deficiency.

B. In exercising the rights and remedies under this Paragraph 14.07, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this paragraph.

C. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.

D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 14.07.

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ARTICLE 15—PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

15.01 *Progress Payments*

A. *Basis for Progress Payments*: The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments for Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.

B. *Applications for Payments*

1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents.

2. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment must also be accompanied by: (a) a bill of sale, invoice, copies of subcontract or purchase order payments, or other documentation establishing full payment by Contractor for the materials and equipment; (b) at Owner's request, documentation warranting that Owner has received the materials and equipment free and clear of all Liens; and (c) evidence that the materials and equipment are covered by appropriate property insurance, a warehouse bond, or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

3. Beginning with the second Application for Payment, each Application must include an affidavit of Contractor stating that all previous progress payments received by Contractor have been applied to discharge Contractor's legitimate obligations associated with prior Applications for Payment.

4. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

C. *Review of Applications*

1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.

2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:

a. the Work has progressed to the point indicated;

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b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 13.03, and any other qualifications stated in the recommendation); and

c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.

3. By recommending any such payment Engineer will not thereby be deemed to have represented that:

   a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract; or

   b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:

   a. to supervise, direct, or control the Work;

   b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto;

   c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work;

   d. to make any examination to ascertain how or for what purposes Contractor has used the money paid by Owner; or

   e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.

5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 15.01.C.2.

6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:

   a. the Work is defective, requiring correction or replacement;

   b. the Contract Price has been reduced by Change Orders;

   c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;

   d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or

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e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.

D. *Payment Becomes Due*

1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended (subject to any Owner set-offs) will become due, and when due will be paid by Owner to Contractor.

E. *Reductions in Payment by Owner*

1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:

a. Claims have been made against Owner based on Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages resulting from Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;

b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;

c. Contractor has failed to provide and maintain required bonds or insurance;

d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;

e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;

f. The Work is defective, requiring correction or replacement;

g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;

h. The Contract Price has been reduced by Change Orders;

i. An event has occurred that would constitute a default by Contractor and therefore justify a termination for cause;

j. Liquidated or other damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;

k. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens; or

l. Other items entitle Owner to a set-off against the amount recommended.

2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, and promptly pay Contractor any amount remaining

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after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, if Contractor remedies the reasons for such action. The reduction imposed will be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.

3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld will be treated as an amount due as determined by Paragraph 15.01.D.1 and subject to interest as provided in the Agreement.

15.02 *Contractor's Warranty of Title*

A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than 7 days after the time of payment by Owner.

15.03 *Substantial Completion*

A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.

B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.

C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which will fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have 7 days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.

D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work,

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property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.

E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.

F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

15.04 *Partial Use or Occupancy*

A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:

1. At any time, Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03.A through 15.03.E for that part of the Work.

2. At any time, Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.

3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 15.03 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 6.04 regarding builder's risk or other property insurance.

15.05 *Final Inspection*

A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work, or agreed portion thereof, is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

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15.06 *Final Payment*

A. *Application for Payment*

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, annotated record documents (as provided in Paragraph 7.12), and other documents, Contractor may make application for final payment.

2. The final Application for Payment must be accompanied (except as previously delivered) by:

a. all documentation called for in the Contract Documents;

b. consent of the surety, if any, to final payment;

c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.

d. a list of all duly pending Change Proposals and Claims; and

e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.

3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.

B. *Engineer's Review of Final Application and Recommendation of Payment*: If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract have been fulfilled, Engineer will, within 10 days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the final Application for Payment to Owner for payment. Such recommendation will account for any set-offs against payment that are necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

C. *Notice of Acceptability*: In support of its recommendation of payment of the final Application for Payment, Engineer will also give written notice to Owner and Contractor that the Work is

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acceptable, subject to stated limitations in the notice and to the provisions of Paragraph 15.07.

D. *Completion of Work*: The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment and issuance of notice of the acceptability of the Work.

E. *Final Payment Becomes Due*: Upon receipt from Engineer of the final Application for Payment and accompanying documentation, Owner shall set off against the amount recommended by Engineer for final payment any further sum to which Owner is entitled, including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions of this Contract with respect to progress payments. Owner shall pay the resulting balance due to Contractor within 30 days of Owner's receipt of the final Application for Payment from Engineer.

15.07 *Waiver of Claims*

A. By making final payment, Owner waives its claim or right to liquidated damages or other damages for late completion by Contractor, except as set forth in an outstanding Claim, appeal under the provisions of Article 17, set-off, or express reservation of rights by Owner. Owner reserves all other claims or rights after final payment.

B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted as a Claim, or appealed under the provisions of Article 17.

15.08 *Correction Period*

A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the Supplementary Conditions or the terms of any applicable special guarantee required by the Contract Documents), Owner gives Contractor written notice that any Work has been found to be defective, or that Contractor's repair of any damages to the Site or adjacent areas has been found to be defective, then after receipt of such notice of defect Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:

1. correct the defective repairs to the Site or such adjacent areas;

2. correct such defective Work;

3. remove the defective Work from the Project and replace it with Work that is not defective, if the defective Work has been rejected by Owner, and

4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting from the corrective measures.

B. Owner shall give any such notice of defect within 60 days of the discovery that such Work or repairs is defective. If such notice is given within such 60 days but after the end of the correction period, the notice will be deemed a notice of defective Work under Paragraph 7.17.B.

C. If, after receipt of a notice of defect within 60 days and within the correction period, Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced.

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Contractor shall pay all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others). Contractor's failure to pay such costs, losses, and damages within 10 days of invoice from Owner will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the failure to pay.

D. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.

E. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

F. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph are not to be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

ARTICLE 16—SUSPENSION OF WORK AND TERMINATION

16.01 *Owner May Suspend Work*

A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by written notice to Contractor and Engineer. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an extension of the Contract Times directly attributable to any such suspension. Any Change Proposal seeking such adjustments must be submitted no later than 30 days after the date fixed for resumption of Work.

16.02 *Owner May Terminate for Cause*

A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination for cause:

1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment, or failure to adhere to the Progress Schedule);

2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;

3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or

4. Contractor's repeated disregard of the authority of Owner or Engineer.

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B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) 10 days' written notice that Owner is considering a declaration that Contractor is in default and termination of the Contract, Owner may proceed to:

1. declare Contractor to be in default, and give Contractor (and any surety) written notice that the Contract is terminated; and

2. enforce the rights available to Owner under any applicable performance bond.

C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work, incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and complete the Work as Owner may deem expedient.

D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if Contractor within 7 days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.

E. If Owner proceeds as provided in Paragraph 16.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses, and damages exceeds such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

F. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.

G. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond will govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

16.03 *Owner May Terminate for Convenience*

A. Upon 7 days' written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):

1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;

2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in

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connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses; and

3. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.

B. Contractor shall not be paid for any loss of anticipated profits or revenue, post-termination overhead costs, or other economic loss arising out of or resulting from such termination.

16.04 *Contractor May Stop Work or Terminate*

A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon 7 days' written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the contract and recover from Owner payment on the same terms as provided in Paragraph 16.03.

B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, 7 days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this paragraph are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

ARTICLE 17—FINAL RESOLUTION OF DISPUTES

17.01 *Methods and Procedures*

A. *Disputes Subject to Final Resolution*: The following disputed matters are subject to final resolution under the provisions of this article:

1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full, pursuant to Article 12; and

2. Disputes between Owner and Contractor concerning the Work, or obligations under the Contract Documents, that arise after final payment has been made.

B. *Final Resolution of Disputes*: For any dispute subject to resolution under this article, Owner or Contractor may:

1. elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions;

2. agree with the other party to submit the dispute to another dispute resolution process; or

3. if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction.

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ARTICLE 18—MISCELLANEOUS

18.01 *Giving Notice*

A. Whenever any provision of the Contract requires the giving of written notice to Owner, Engineer, or Contractor, it will be deemed to have been validly given only if delivered:

1. in person, by a commercial courier service or otherwise, to the recipient's place of business;

2. by registered or certified mail, postage prepaid, to the recipient's place of business; or

3. by e-mail to the recipient, with the words "Formal Notice" or similar in the e-mail's subject line.

18.02 *Computation of Times*

A. When any period of time is referred to in the Contract by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

18.03 *Cumulative Remedies*

A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract. The provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

18.04 *Limitation of Damages*

A. With respect to any and all Change Proposals, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.

18.05 *No Waiver*

A. A party's non-enforcement of any provision will not constitute a waiver of that provision, nor will it affect the enforceability of that provision or of the remainder of this Contract.

18.06 *Survival of Obligations*

A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract, as well as all continuing obligations indicated in the Contract, will survive final payment, completion, and acceptance of the Work or termination of the Contract or of the services of Contractor.

18.07 *Controlling Law*

A. This Contract is to be governed by the law of the state in which the Project is located.

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18.08 *Assignment of Contract*

A. Unless expressly agreed to elsewhere in the Contract, no assignment by a party to this Contract of any rights under or interests in the Contract will be binding on the other party without the written consent of the party sought to be bound; and, specifically but without limitation, money that may become due and money that is due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract.

18.09 *Successors and Assigns*

A. Owner and Contractor each binds itself, its successors, assigns, and legal representatives to the other party hereto, its successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.

18.10 *Headings*

A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

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ETMACKE-01 SDEWITT

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY) 9/20/2023

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER	CONTACT NAME: Sue DeWitt
David Chapman Agency, Inc. P.O. Box 30109 Lansing, MI 48909	PHONE (A/C, No, Ext): (517) 319-8232 FAX (A/C, No): (517) 321-9443 E-MAIL ADDRESS: sdewitt@davidchapmanagency.com

INSURER(S) AFFORDING COVERAGE	NAIC #
INSURER A : Amerisure Mutual Insurance Co	23396
INSURER B : Westchester Surplus Lines Ins	10172
INSURER C :	
INSURER D :	
INSURER E :	
INSURER F :	

INSURED

E T MacKenzie Company
4248 W. Saginaw Hwy
Grand Ledge, MI 48837-2225

COVERAGES **CERTIFICATE NUMBER:** **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	X COMMERCIAL GENERAL LIABILITY CLAIMS-MADE X OCCUR X Contractual Liab X XCU Included GEN'L AGGREGATE LIMIT APPLIES PER: POLICY X PRO-JECT LOC OTHER:			CPP20938371102	8/15/2023	8/15/2024	EACH OCCURRENCE DAMAGE TO RENTED PREMISES (Ea occurrence) MED EXP (Any one person) PERSONAL & ADV INJURY GENERAL AGGREGATE PRODUCTS - COMP/OP AGG	$ 1,000,000 $ 1,000,000 $ 10,000 $ 1,000,000 $ 2,000,000 $ 2,000,000
A	AUTOMOBILE LIABILITY X ANY AUTO OWNED AUTOS ONLY SCHEDULED AUTOS X HIRED AUTOS ONLY X NON-OWNED AUTOS ONLY			CA20390662501	8/15/2023	8/15/2024	COMBINED SINGLE LIMIT (Ea accident) BODILY INJURY (Per person) BODILY INJURY (Per accident) PROPERTY DAMAGE (Per accident)	$ 1,000,000 $ $ $
A	X UMBRELLA LIAB X OCCUR EXCESS LIAB CLAIMS-MADE DED RETENTION $			CU20638911402	8/15/2023	8/15/2024	EACH OCCURRENCE AGGREGATE	$ 10,000,000 $ 10,000,000
A	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? Y / N (Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATIONS below	N / A		WC13816012402	8/15/2023	8/15/2024	X PER STATUTE OTH-ER E.L. EACH ACCIDENT E.L. DISEASE - EA EMPLOYEE E.L. DISEASE - POLICY LIMIT	$ 1,000,000 $ 1,000,000 $ 1,000,000
B	Pollution Liability			G27071752011	8/15/2023	8/15/2024	Ea 1,000,000 Agg	3,000,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

Re: Project #221916 Well 2 Raw Water Main -- Grand Ledge, Eaton County Michigan

City of Grand Ledge, Fishbeck, and Materials Testing Consultants are additional insured on general liability and umbrella liability per written contract or agreement per form CG7324 (ongoing & completed ops) , automobile liability per form CA7115 and pollution liability per forms ENV3250 (ongoing) and ENV3251 (completed ops).

CERTIFICATE HOLDER

City of Grand Ledge
310 Greenwood Street
Grand Ledge, MI 48837

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

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THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

CONTRACTOR'S BLANKET FLEX ADDITIONAL INSURED ENDORSEMENT – FORM A

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART

Policy Number CPP209383711	**Agency Number** 0115289	**Policy Effective Date** 08/15/2023
Policy Expiration Date 08/15/2024	**Date** 08/15/2023	**Account Number** 10393460
Named Insured E. T. MACKENZIE COMPANY	**Agency** DAVID CHAPMAN AGENCY INC.	**Issuing Company** AMERISURE MUTUAL INS.CO.

A. SECTION II - WHO IS AN INSURED is amended to add as an additional insured:

1. Any person ororganization with whom you have agreed in a "written agreement" that such person or organization be added as an additional insured on this policy, and any other person or organization you are required to add as an additional insured under such "written agreement".

2. If "your work" began under a written letter of intent or written work order, any person or organization who issued the written letter of intent or written work order, but:

a. such coverage will apply only for 30 calendar days following the date the written letter of intent or written work order was issued; and

b. the person or organization is an additional insured only for, and to the extent of, liability arising out of "bodily injury", "property damage", or "personal and advertising injury" caused, in whole or in part, by your negligent acts or omissions, or the negligent acts or omissions of others working on your behalf, in the performance of your work as specified in the written letter of intent or written work order. This coverage does not apply to liability arising out of the independent acts or omissions of the additional insured.

For the purposes of the coverage provided by this endorsement, a "written agreement" means a written contract or written agreement that:

1. requires you to include a person or organization as an additional insured for a period of time during the policy period; and

2. is executed prior to the occurrence of "bodily injury", "property damage", or "personal and advertising injury" that forms the basis for a claim under this policy.

The insurance provided by this endorsement does not apply to any person or organization that is specifically listed as an additional insured on another endorsement attached to this policy.

B. The coverage provided to any person or organization added as an additional insured pursuant to Paragraph **A.1** is limited as follows:

1. If the "written agreement" specifically and exclusively requires you to name the person or organization as an additional insured using the ISO CG 20 10 endorsement with edition dates of 11 85 or 10 01, or the ISO CG 20 37 10 01 endorsement, that person or organization is an additional insured, but only with respect to liability for "bodily injury", "property damage", or "personal and advertising injury" arising out of "your work" for that insured by or for you.

2. If the "written agreement" requires you to name the person or organization as an additional insured using the ISO CG 20 10 and or CG 20 37 endorsements without specifically and exclusively requiring the 11 85 or 10 01 edition dates, that person or organization is an additional insured, but only with respect to liability for "bodily injury", "property damage", or "personal and advertising injury" caused, in whole or in part, by your acts or omissions or the acts or omissions of those acting on your behalf.

3. If the "written agreement" requires you to name the person or organization as an additional insured for operations arising out of your work and does not specify an ISO additional insured endorsement, that person or organization is an additional insured, but only with respect to liability for "bodily injury", "property damage", or "personal and advertising injury" arising out of your acts or omissions, or the acts or omissions of others working on your behalf, in the performance of your work as specified in the "written agreement". This coverage does not apply to liability arising out of the sole negligence of the additional insured unless specifically required in the "written agreement".

4. If none of the above paragraphs apply, then the person or organization is an additional insured only for, and to the extent of, liability arising out of "bodily injury", "property damage", or "personal and advertising injury" caused, in whole or in part, by your negligent acts or omissions, or the negligent acts or omissions of others working on your behalf, in the performance of your work as specified in the "written agreement". This coverage does not apply to liability arising out of the independent acts or omissions of the additional insured.

However, the insurance afforded to such additional insured only applies to the extent permitted by law.

C. The insurance provided to an additional insured under this endorsement does not apply to:

1. "Bodily injury" or "property damage" included in the "products-completed operations hazard" unless the "written agreement" specifically requires such coverage (including by specifically requiring the CG 20 10 11 85). To the extent the "written agreement" requires such coverage for a specified amount of time, the coverage provided by this endorsement is limited to the amount of time required for such coverage by the "written agreement".

2. "Bodily injury", "property damage", or "personal and advertising injury" arising out of an architect's, engineer's, or surveyor's rendering of, or failure to render, any professional services, including but not limited to:

a. The preparing, approving, or failing to prepare or approve:
- **(1)** Maps;
- **(2)** Drawings;
- **(3)** Opinions;
- **(4)** Reports;
- **(5)** Surveys;
- **(6)** Change orders;

(7) Design specifications; and

b. Supervisory, inspection, or engineering services.

D. The limits of insurance that apply to the additional insured are the least of those specified in the "written agreement" or declarations of this policy.

Coverage provided by this endorsement for any additional insured shall not increase the applicable Limits of Insurance shown in the Declarations. The limits of insurance that apply to the additional insured are inclusive of, and not in addition to, the Limits of Insurance shown in the Declarations.

E. With respect to the coverage provided by this endorsement, **SECTION IV – COMMERCIAL GENERAL LIABILITY CONDITIONS,** Paragraph **4. Other Insurance** is deleted and replaced with the following:

4. **Other Insurance.**

a. Coverage provided by this endorsement is excess over any other valid and collectible insurance available to the additional insured whether:

(1) Primary;
(2) Excess;
(3) Contingent; or
(4) On any other basis.

In addition, this insurance is excess over any self-insured retentions, deductibles, or captive retentions payable by the additional insured or payable by any person or organization whose coverage is available to the additional insured.

However, if the "written agreement" requires primary and non-contributory coverage, this insurance will be primary and non-contributory relative only to the other insurance available to the additional insured which covers that person or organization as a Named Insured, and we will not share with that other insurance. For any other insurance available to the additional insured where that person or organization is not a Named Insured, this policy will share coverage with that other insurance based on the terms specified in Paragraph **b**. Method of Sharing below.

b. Method of Sharing

If all the other insurance permits contribution by equal shares, we will follow this method also. Under this method, each insurer contributes equal amounts until it has paid its applicable limit of insurance or none of the loss remains, whichever comes first.

If any of the other insurance does not permit contribution by equal shares, we will contribute by limits. Under this method, each insurer's share is based on the ratio of its applicable limit of insurance to the total applicable limits of insurance of all insurers.

Westchester
A Chubb Company

ADDITIONAL INSURED ENDORSEMENT – PRODUCTS-COMPLETED OPERATIONS HAZARD

Named Insured			Endorsement Number
E T MacKenzie Company			
Policy Symbol	Policy Number	Policy Period	Effective Date of Endorsement
CPW	G27071752 011	08/15/2023 TO 08/15/2024	08/15/2023
Issued By (Name of Insurance Company)			
Westchester Surplus Lines Insurance Company			

Insert the policy number. The remainder of the information is to be completed only when this endorsement is issued subsequent to the preparation of the policy.

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

THIS ENDORSEMENT MODIFIES INSURANCE PROVIDED UNDER THE FOLLOWING:

CONTRACTORS POLLUTION LIABILITY COVERAGE PART

SCHEDULE

Name of Person or Organization:

As required by written contract or agreement signed by both parties prior to a loss to which this insurance applies.

(If no entry appears above, information required to complete this endorsement will be shown in the Declarations as applicable to this endorsement.)

A. **SECTION II – WHO IS AN INSURED** is amended to include as an additional insured the person(s) or organization(s) shown in the Schedule, but only with respect to liability for injury or damage, to which this insurance applies, caused by or resulting from **your work** performed for that additional insured and included in the **products-completed operations hazard,** and only to the extent that such injury or damage is caused, in whole or in part, by your negligence or the negligence of those acting on your behalf.

However:

1. The insurance afforded to such additional insured only applies to the extent permitted by law; and

2. If coverage provided to the additional insured is required by a contract or agreement, the insurance afforded to such additional insured will not be broader than that which you are required by the contract or agreement to provide for such additional insured.

B. With respect to the insurance afforded to these additional insureds, the following is added to **SECTION III - LIMITS OF INSURANCE:**

If coverage provided to the additional insured is required by a contract or agreement, the most we will pay on behalf of the additional insured is the amount of insurance:

1. Required by the contract or agreement; or

2. Available under the applicable Limits of Insurance shown in the Declarations;

whichever is less.

This endorsement shall not increase the applicable Limits of Insurance shown in the Declarations.

All other terms and conditions of this policy remain unchanged.

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Westchester
A Chubb Company

ADDITIONAL INSURED ENDORSEMENT – ONGOING WORK OR OPERATIONS

Named Insured			Endorsement Number
E T MacKenzie Company			
Policy Symbol	Policy Number	Policy Period	Effective Date of Endorsement
CPW	G27071752 011	08/15/2023 TO 08/15/2024	08/15/2023
Issued By (Name of Insurance Company)			
Westchester Surplus Lines Insurance Company			

Insert the policy number. The remainder of the information is to be completed only when this endorsement is issued subsequent to the preparation of the policy.

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

THIS ENDORSEMENT MODIFIES INSURANCE PROVIDED UNDER THE FOLLOWING:

CONTRACTORS POLLUTION LIABILITY COVERAGE PART

SCHEDULE:

Name of Person(s) or Organization(s):

As required by written contract or agreement signed by both parties prior to a loss to which this insurance applies.

(If no entry appears above, information required to complete this endorsement will be shown in the Declarations as applicable to this endorsement.)

A. **SECTION II - WHO IS AN INSURED** is amended to include as an additional insured the persons or organizations shown in the Schedule, but only with respect to liability for injury or damage, to which this insurance applies, caused, in whole or in part, by:

1. Your acts or omissions; or
2. The acts or omissions of those acting on your behalf;

in the performance of your ongoing operations for the additional insureds.

However:

1. The insurance afforded to such additional insured only applies to the extent permitted by law; and
2. If coverage provided to the additional insured is required by a contract or agreement, the insurance afforded to such additional insured will not be broader than that which you are required by the contract or agreement to provide for such additional insured.

B. With respect to the insurance afforded to these additional insureds, the following exclusion is added:

Exclusions

This insurance does not apply to injury or damage occurring after:

a. All work or operations, including materials, parts or equipment furnished in connection with such work or operations, on the project (other than service, maintenance or repairs) to be performed by you or on your behalf at the site of the covered operations has been completed; or

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b. That portion of **your work** out of which the injury or damage arises has been put to its intended use by any person or organization other than another contractor or subcontractor engaged in performing operations for the additional insured as a part of the same project.

C. With respect to the insurance afforded to these additional insureds, the following is added to **SECTION III – LIMITS OF INSURANCE:**

If coverage provided to the additional insured is required by a contract or agreement, the most we will pay on behalf of the additional insured is the amount of insurance:

1. Required by the contract or agreement; or

2. Available under the applicable Limits of Insurance shown in the Declarations;

whichever is less.

This endorsement shall not increase the applicable Limits of Insurance shown in the Declarations.

All other terms and conditions of this policy remain unchanged.

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ETMACKE-01 SDEWITT

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY) 9/20/2023

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER	CONTACT NAME:	
David Chapman Agency, Inc. P.O. Box 30109 Lansing, MI 48909	PHONE (A/C, No, Ext): (517) 321-4600	FAX (A/C, No): (517) 321-9443
	E-MAIL ADDRESS:	
	INSURER(S) AFFORDING COVERAGE	NAIC #
	INSURER A : Amerisure Mutual Insurance Co	23396
INSURED	INSURER B :	
City of Grand Ledge 310 Greenwood Grand Ledge, MI 48837	INSURER C :	
	INSURER D :	
	INSURER E :	
	INSURER F :	

COVERAGES **CERTIFICATE NUMBER:** **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	COMMERCIAL GENERAL LIABILITY				9/20/2023	12/1/2024	EACH OCCURRENCE	$ 3,000,000
	☐ CLAIMS-MADE ☐ OCCUR						DAMAGE TO RENTED PREMISES (Ea occurrence)	$
	X Owner's & Contractor						MED EXP (Any one person)	$
							PERSONAL & ADV INJURY	$
	GEN'L AGGREGATE LIMIT APPLIES PER:						GENERAL AGGREGATE	$ 3,000,000
	☐ POLICY ☐ PRO-JECT ☐ LOC						PRODUCTS - COMP/OP AGG	$
	☐ OTHER:							$
	AUTOMOBILE LIABILITY						COMBINED SINGLE LIMIT (Ea accident)	$
	☐ ANY AUTO						BODILY INJURY (Per person)	$
	☐ OWNED AUTOS ONLY ☐ SCHEDULED AUTOS						BODILY INJURY (Per accident)	$
	☐ HIRED AUTOS ONLY ☐ NON-OWNED AUTOS ONLY						PROPERTY DAMAGE (Per accident)	$
	☐							$
	☐ UMBRELLA LIAB ☐ OCCUR						EACH OCCURRENCE	$
	☐ EXCESS LIAB ☐ CLAIMS-MADE						AGGREGATE	$
	☐ DED ☐ RETENTION $							$
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY Y / N						☐ PER STATUTE ☐ OTH-ER	
	ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? ☐ (Mandatory in NH)	N / A					E.L. EACH ACCIDENT	$
	If yes, describe under DESCRIPTION OF OPERATIONS below						E.L. DISEASE - EA EMPLOYEE	$
							E.L. DISEASE - POLICY LIMIT	$

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

Fishbeck is additional insured on the owners protective policy

CERTIFICATE HOLDER

Fishbeck
1515 Arboretum Drive SE
Grand Rapids, MI 49546

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

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SECTION 00 73 00 - SUPPLEMENTARY CONDITIONS

These Supplementary Conditions amend or supplement the General Conditions (Standard General Conditions of the Construction Contract). All provisions which are not so amended or supplemented remain in full force and effect.

The terms used in these Supplementary Conditions have the meanings stated in the General Conditions. Additional terms used in these Supplementary Conditions have the meanings stated below, which are applicable to both the singular and plural thereof.

The address system used in these Supplementary Conditions is the same as the address system in the General conditions, with the Prefix "SC" added thereto.

ARTICLE 1 - DEFINITIONS AND TERMINOLOGY

SC-1.01 Defined Terms

Add the following language to the first sentence of Paragraph 1.01.A:

; except where the terms "Architect," "Engineer," and "Contractor" are preceded by an adjective, the term shall then be understood to refer to the entity described by the combination of the two words.

SC-1.01.A.22 Engineer

Delete Paragraph 1.01.A.22 in its entirety and insert the following in its place:

22. Engineer - The individual or entity named as Engineer or Architect in the Agreement.

SC-1.01.A.42 Substantial Completion

Add the following paragraph immediately after Paragraph 1.01.A.42:

Substantial Completion shall also mean that, with the exception of minor, superficial, or other specific items of the Work as indicated in the specifications or approved by Engineer, construction activities are completed.

Substantial Completion shall specifically include the following items:

a. Water Main is installed, tested and ready for service.
b. Well 2 VFD is installed, tested and ready for service.
c. Grading and Pavement Restoration is complete, including, but not necessarily limited to, approaches, sidewalks, and any curb and gutter.
d. Restoration work is complete except for established vegetation growth.

Add the following paragraphs immediately after Paragraph 1.01.A.50:

51. Architect - The individual or entity named as Architect or Engineer in the Agreement.

52. Bulletin **-** A document delineating possible changes to the Contract Documents which is issued by Engineer for Owner and requests add or deduct costs from Contractor.

53. General Contractor - The Contractor as defined in Paragraph 1.01.A.16.

54. Manufacturer - An individual or entity that manufactures, assembles, or fabricates Products.

55. Products - Systems, materials, manufactured units, equipment, components and accessories used in the Work.

56. Request for Information (or RFI): A written document initiated by Contractor which requests clarifications to items of the Work from Engineer.

ARTICLE 2 - PRELIMINARY MATTERS

SC-2.01 Delivery of Performance and Payment Bonds and Evidence of Insurance

Delete Paragraph 2.01.B in its entirety and insert the following in its place:

B. When Contractor delivers the executed Agreements to Owner, Contractor shall also deliver to Owner, with copies to each additional insured identified herein, certificates of insurance, endorsements to Contractor's insurance policies (and other evidence of insurance which Owner or any additional insured may reasonably request) which Contractor is required to purchase and maintain in accordance with Article 6.

ARTICLE 3 – CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

SC-3.04 Requirements of the Contract Documents

Add the following new paragraph immediately after Paragraph 3.04.C.:

D. Owner shall be entitled to deduct from the Contract Price amounts paid to Engineer for Engineer to evaluate and respond to Contractor's requests for information, where such information was available to Contractor from a careful study and comparison of the Contract Documents, field conditions, other Owner-provided information, Contractor-prepared coordination drawings, or prior Project correspondence or documentation.

ARTICLE 4 – COMMENCEMENT AND PROGRESS OF THE WORK

SC-4.01 Commencement of Contract Times; Notice to Proceed

Amend the third sentence of Paragraph 4.01.A to read as follows:

In no event will the Contract Times commence to run later than 120 days after the day of Bid opening or the 30th day after the Effective Date of the Agreement, whichever date is earlier.

ARTICLE 5 - SITE, SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

SC-5.03 Subsurface and Physical Conditions

Add the following new paragraphs immediately after Paragraph 5.03.D.4:

E. The following reports of explorations and tests of subsurface conditions at or contiguous to the Site are known to Owner:

1. Report dated March 2023, prepared by Materials Testing Consultant entitled: Geotechnical Report Grand Ledge Well 2 Raw Water Main consisting of 34 pages. The "technical data" contained in such report upon which Contractor may rely is the soil boring logs at the locations and for the conditions at the time the soil borings were taken. This report has been included in the Section entitled Geotechnical Data.

F. The following drawings of physical conditions relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) are known to Owner:

1. City of Grand Ledge Degroff Street Reconstruction Record Drawings prepared by Fitzgerald Henne & Associates dated May 28, 2009.

2. City of Grand Ledge Iron Removal Plant Bid Drawings Prepared by Fishbeck dated November 1, 2022.

SC-5.06 Hazardous Environmental Condition at Site

Delete Paragraphs 5.06.A and 5.06.B in their entirety and insert the following:

A. Reports and Drawings: No reports or drawings related to Hazardous Environmental Conditions at the Site are known to Owner.

ARTICLE 6 - BONDS AND INSURANCE

SC-6.03 Contractor's Insurance

Delete Paragraph 6.03.B.3 in its entirety and insert the following in its place:

3. remain in effect at least until the end of the correction period and at all times thereafter when Contractor may be correcting, removing or replacing defective Work in accordance with Paragraph 15.06; and

Supplement Paragraph 6.03 with the following provisions after Paragraph 6.03.C:

D. Other Additional Insureds: As a supplement to the provisions of Paragraph 6.03.C of the General Conditions, the commercial general liability, automobile liability, umbrella or excess, pollution liability, and unmanned aerial vehicle liability policies must include as additional insureds (in addition to Owner and Engineer) the following:

1. City of Grand Ledge;
2. Fishbeck;
3. Materials Testing Consultants.

E. Workers' Compensation and Employer's Liability*:* Contractor shall purchase and maintain workers' compensation and employer's liability insurance, including, as applicable, United States Longshoreman and Harbor Workers' Compensation Act, Jones Act, stop-gap employer's liability coverage for monopolistic states, and foreign voluntary workers' compensation (from available sources, notwithstanding the jurisdictional requirement of Paragraph 6.02.B of the General Conditions).

Workers' Compensation and Related Policies	**Policy limits of not less than:**
Workers' Compensation	
State	Statutory
Applicable Federal (e.g., Longshoreman's)	Statutory
Foreign voluntary workers' compensation (employer's responsibility coverage), if applicable	Statutory
Employer's Liability	
Each accident	$2,000,000
Each employee	$2,000,000
Policy limit	$2,000,000

F. Commercial General Liability—Claims Covered: Contractor shall purchase and maintain commercial general liability insurance, covering all operations by or on behalf of Contractor, on an occurrence basis, against claims for:

1. damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees,
2. damages insured by reasonably available personal injury liability coverage, and
3. damages because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom.

G. Commercial General Liability—Form and Content*:* Contractor's commercial liability policy must be written on a 1996 (or later) Insurance Services Organization, Inc. (ISO) commercial general liability form (occurrence form) and include the following coverages and endorsements:

1. Products and completed operations coverage.
   a. Such insurance must be maintained for three years after final payment.

b. Contractor shall furnish Owner and each other additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract) evidence of continuation of such insurance at final payment and three years thereafter.

2. Blanket contractual liability coverage, including but not limited to coverage of Contractor's contractual indemnity obligations in Paragraph 7.18.
3. Severability of interests and no insured-versus-insured or cross-liability exclusions.
4. Underground, explosion, and collapse coverage.
5. Personal injury coverage.
6. Additional insured endorsements that include both ongoing operations and products and completed operations coverage through ISO Endorsements CG 20 10 10 01 and CG 20 37 10 01 (together). If Contractor demonstrates to Owner that the specified ISO endorsements are not commercially available, then Contractor may satisfy this requirement by providing equivalent endorsements.
7. For design professional additional insureds, ISO Endorsement CG 20 32 07 04 "Additional Insured—Engineers, Architects or Surveyors Not Engaged by the Named Insured" or its equivalent.

H. Commercial General Liability—Excluded Content*:* The commercial general liability insurance policy, including its coverages, endorsements, and incorporated provisions, must not include any of the following:

1. Any modification of the standard definition of "insured contract" (except to delete the railroad protective liability exclusion if Contractor is required to indemnify a railroad or others with respect to Work within 50 feet of railroad property).
2. Any exclusion for water intrusion or water damage.
3. Any provisions resulting in the erosion of insurance limits by defense costs other than those already incorporated in ISO form CG 00 01.
4. Any exclusion of coverage relating to earth subsidence or movement.
5. Any exclusion for the insured's vicarious liability, strict liability, or statutory liability (other than worker's compensation).
6. Any limitation or exclusion based on the nature of Contractor's work.
7. Any professional liability exclusion broader in effect than the most recent edition of ISO form CG 22 79.

I. Commercial General Liability—Minimum Policy Limits

Commercial General Liability	**Policy limits of not less than:**
General Aggregate	$3,000,000
Products—Completed Operations Aggregate	$3,000,000
Personal and Advertising Injury	$3,000,000
Bodily Injury and Property Damage—Each Occurrence	$3,000,000

J. Automobile Liability: Contractor shall purchase and maintain automobile liability insurance for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance, or use of any motor vehicle. The automobile liability policy must be written on an occurrence basis.

Automobile Liability	**Policy limits of not less than:**
Bodily Injury	
Each Person	$3,000,000
Each Accident	$3,000,000
Property Damage	
Each Accident	$3,000,000
[or]	
Combined Single Limit	
Combined Single Limit (Bodily Injury and Property Damage)	$3,000,000

K. Umbrella or Excess Liability*:* Contractor shall purchase and maintain umbrella or excess liability insurance written over the underlying employer's liability, commercial general liability, and automobile liability insurance described in the Paragraphs above. The coverage afforded must be at least as broad as that of each and every one of the underlying policies.

Excess or Umbrella Liability	**Policy limits of not less than:**
Each Occurrence	$3,000,000
General Aggregate	$3,000,000

L. Using Umbrella or Excess Liability Insurance to Meet CGL and Other Policy Limit Requirements*:* Contractor may meet the policy limits specified for employer's liability, commercial general liability, and automobile liability through the primary policies alone, or through combinations of the primary insurance policy's policy limits and partial attribution of the policy limits of an umbrella or excess liability policy that is at least as broad in coverage as that of the underlying policy, as specified herein. If such umbrella or excess liability policy was required under this Contract, at a specified minimum policy limit, such umbrella or excess policy must retain a minimum limit of $3,000,000 after accounting for partial attribution of its limits to underlying policies, as allowed above.

M. Contractor's Pollution Liability Insurance*:* Contractor shall purchase and maintain a policy covering third-party injury and property damage, including cleanup costs, as a result of pollution conditions arising from Contractor's operations and completed operations. This insurance must be maintained for no less than three years after final completion.

Contractor's Pollution Liability	**Policy limits of not less than:**
Each Occurrence/Claim	$1,000,000
General Aggregate	$1,000,000

N. Owner's and Contractor's Protective Liability Insurance

Delete Paragraph 6.02.G in its entirety and insert the following in its place:

1. Any Contractor shall purchase and maintain Owner's and Contractor's Protective Liability Insurance which shall:
    a. be written by the same insurance carrier as Contractor's Liability Insurance;
    b. be a separate policy to protect Owner, Engineer, their consultants, agents, employees and such public corporations in whose jurisdiction the Work is located for their liability for work performed by Contractor or Subcontractors under this Contract;
    c. name Owner as the insured;
    d. name the following as additional insured;
        i. Fishbeck
    e. Be issued by an insurer who endorses the policy to reflect that, in the event of payment of any loss or damages, subrogation rights under these Contract Documents will be waived by the insurer with respect to claims against Owner and Engineer.
    f. Provide coverage for not less than the following amounts:

Owner's and Contractor's Protective Liability	**Policy limits of not less than:**
Each Claim	$3,000,000
Annual Aggregate	$3,000,000

ARTICLE 7 – CONTRACTOR'S RESPONSIBILITIES

SC-7.04 Services, Materials and Equipment

Add the following language at the end of Paragraph 6.03.A:

Owner requires that the rates of wages and fringe benefits to be paid to each class of mechanics by Contractor and all Subcontractors shall be not less than the wage and fringe benefit rates prevailing in the locality in which the Work is to be performed. Prevailing wage and fringe benefit rates shall be determined in accordance with the Davis Bacon Wage Determination schedules published periodically by the U.S. Department of Labor Wage Decision.

SC-7.09 Permits

Add the following language at the end of Paragraph 7.09.A:

Additional provisions regarding permits and licenses are included in the General Requirements.

SC-7.11 Laws and Regulations

Add the following paragraph immediately after Paragraph 7.11.C:

D. Funding for the Project is provided in part by the EGLE Drinking Water State Revolving Fund and Contract Documents reflect the requirements of that authority.

SC-7.16 Shop Drawings and Sample Requirements

Add the following new paragraphs immediately after Paragraph 7.16.D.3:

4. Contractor shall furnish required submittals with sufficient information and accuracy in order to obtain required approval of an item with no more than two submittals. Engineer will record Engineer's time for reviewing subsequent submittals of Shop Drawings, samples, or other items requiring approval and Owner will deduct amount paid for Engineer's charges for such time from payment to Contractor.

ARTICLE 10 - ENGINEER'S STATUS DURING CONSTRUCTION

SC-10.03 Resident Project Representative

Add the following new paragraphs immediately after Paragraph 10.03.B:

C. The Resident Project Representative (RPR) will be Engineer's representative at the Site. RPR's dealings in matters pertaining to the Work in general will be with Engineer and Contractor. RPR's dealings with Subcontractors will only be through or with the full knowledge or approval of Contractor. The RPR will:

1. Conferences and Meetings*:* Attend meetings with Contractor, such as preconstruction conferences, progress meetings, job conferences, and other Project-related meetings (but not including Contractor's safety meetings), and as appropriate prepare and circulate copies of minutes thereof.

2. Safety Compliance*:* Comply with Site safety programs, as they apply to RPR, and if required to do so by such safety programs, receive safety training specifically related to RPR's own personal safety while at the Site.

3. Liaison*:*

a. Serve as Engineer's liaison with Contractor. Working principally through Contractor's authorized representative or designee, assist in providing information regarding the provisions and intent of the Contract Documents.

b. Assist Engineer in serving as Owner's liaison with Contractor when Contractor's operations affect Owner's on-Site operations.

c. Assist in obtaining from Owner additional details or information, when required for Contractor's proper execution of the Work.

4. Review of Work; Defective Work:

a. Conduct on-Site observations of the Work to assist Engineer in determining, to the extent set forth in Paragraph 10.02, if the Work is in general proceeding in accordance with the Contract Documents.

b. Observe whether any Work in place appears to be defective.

c. Observe whether any Work in place should be uncovered for observation, or requires special testing, inspection or approval.

5. Inspections and Tests*:*

a. Observe Contractor-arranged inspections required by Laws and Regulations, including but not limited to those performed by public or other agencies having jurisdiction over the Work.

b. Accompany visiting inspectors representing public or other agencies having jurisdiction over the Work.

6. Payment Requests*:* Review Applications for Payment with Contractor.

7. Completion:

a. Participate in Engineer's visits regarding Substantial Completion.

b. Assist in the preparation of a punch list of items to be completed or corrected.

c. Participate in Engineer's visit to the Site in the company of Owner and Contractor regarding completion of the Work, and prepare a final punch list of items to be completed or corrected by Contractor.

d. Observe whether items on the final punch list have been completed or corrected.

D. The RPR will not:

1. Authorize any deviation from the Contract Documents or substitution of materials or equipment (including "or-equal" items).

2. Exceed limitations of Engineer's authority as set forth in the Contract Documents.

3. Undertake any of the responsibilities of Contractor, Subcontractors, or Suppliers.

4. Advise on, issue directions relative to, or assume control over any aspect of the means, methods, techniques, sequences or procedures of construction.

5 Advise on, issue directions regarding, or assume control over security or safety practices, precautions, and programs in connection with the activities or operations of Owner or Contractor.

6. Participate in specialized field or laboratory tests or inspections conducted off-site by others except as specifically authorized by Engineer.

7. Authorize Owner to occupy the Project in whole or in part.

ARTICLE 15 - PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

SC-15.01.B Applications for Payment

Add the following new paragraph immediately after Paragraph 15.01.B.4:

5. Contractor shall indicate on the Application for Payment the amounts which are due to Owner from Contractor in accordance with the Contract Documents and which amounts Owner may deduct from the progress payment.

SC-15.01.C Review of Applications

Add the following new paragraphs immediately after Paragraph 15.01.C.6.e:

f. Contractor has incurred liability for other costs in accordance with Contract Documents.

g. liability for liquidated damages has been incurred by Contractor.

h. of Contractor's failure to maintain record documents in accordance with Paragraph 7.12.

SC-15.03 Substantial Completion

Add the following new subparagraph to Paragraph 15.03.B:

1. If some or all of the Work has been determined not to be at a point of Substantial Completion and will require re-inspection or re-testing by Engineer, the cost of such re-inspection or re-testing, including the cost of time, travel and living expenses, will be paid by Contractor to Owner. If Contractor does not pay, or the parties are unable to agree as to the amount owed, then Owner may impose a reasonable set-off against payments due under this Article 15.

ARTICLE 16 - SUSPENSION OF WORK AND TERMINATION

SC-16.02 Owner May Terminate for Cause

Add the following new paragraph immediately after Paragraph 16.02.A.4:

5. Contractor has filed a bankruptcy petition and neither Contractor nor trustee has either assumed or rejected this Contract within 30 days after the filing of the bankruptcy petition;

ARTICLE 17 – FINAL RESOLUTION OF DISPUTES

Add the following paragraphs after 17.01 Methods and Procedures:

SC-17.02 Attorneys' Fees

Add the following new paragraph immediately after Paragraph 17.02

17.02 Attorneys' Fees

A. For any matter subject to final resolution under this Article, the prevailing party shall be entitled to an award of its attorneys' fees incurred in the final resolution proceedings, in an equitable amount to be determined in the discretion of the court, arbitrator, arbitration panel, or other arbiter of the matter subject to final resolution, taking into account the parties' initial demand or defense positions in comparison with the final result.

END OF SECTION 00 73 00

SECTION 01 11 00 – SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work covered by the Contract Documents comprises of the construction of the Well 2 Raw Water Main at 425 East River Street to the City of Grand Ledge Water Treatment Plant at 320 East Saginaw Highway, Grand Ledge, Michigan 48837 for the City of Grand Ledge, Owner.

B. The Work includes the following major items:
   1. Furnishing, placement and testing of the 8-inch raw water main.
   2. Connection at Well 2 and the Water Treatment Plant.
   3. Furnish and install VFD at Well 2.
   4. Restoration of disturbed areas including asphalt, concrete and lawn area.

1.3 TYPE OF CONTRACT

A. Construct the Work of this Contract under a single unit price Contract.

1.4 GENERAL

A. Imperative Language: These Specifications (Divisions 01 through 49) are written in the imperative and abbreviated form. This imperative language of the technical specifications is directed at Contractor unless specifically noted otherwise. Incomplete sentences shall be completed by inserting "shall", "shall be" and similar mandatory phrases by inference in the same manner as they are applied to notes on Drawings. The words "shall", "shall be" and similar mandatory phrases shall be supplied by inference where a colon (:) is used within sentences or phrases. Except as worded to the contrary, fulfill (perform) all indicated requirements whether stated in the imperative or otherwise.

B. Related Sections: Some Sections of these Specifications (Divisions 01 through 49) may include a paragraph titled "Related Sections". This paragraph is an aid to the Project Manual user and is not intended to include all Sections which may be related. It is Contractor's obligation to coordinate all Sections whether indicated under "Related Sections" or not.

C. Reference to the General Conditions: In Divisions 01 through 49, a reference to the General Conditions includes by inference all amendments or supplements in the Supplementary Conditions.

1.5 OWNER FURNISHED MATERIAL

A. Products furnished and paid for by Owner: None.

1.6 WORK UNDER OTHER CONTRACTS

A. Owner has awarded a Contract for furnishing and installation of the following work:
   1. Construction of an Iron Removal Plant at 320 East Saginaw Highway.

B. Coordinate the schedule of work under other contracts with Owner and other contractors.

C. Cooperate with all contractors performing work on the site.

D. Copies of Contract Documents for work under separate contracts are available for review at the Engineer's office.

1.7 PROCUREMENT CONTRACTS TO BE ASSIGNED TO THE CONTRACTOR

A. None.

1.8 CONTRACTOR USE OF PREMISES

A. Limit use of premises to allow for Owner occupancy and public access.

B. Coordinate use of premises under direction of the Owner and Engineer.

C. Where the Contract Documents identify certain site elements within the construction limits, such as sidewalks, drives, and streets, that must be kept open for public or the Owner's use during construction, the Contractor shall be responsible for protection and maintenance of such elements as well.

D. Except in connection with the safety or protection of persons or the Work or property at the Site or adjacent thereto, all Work at the site shall be restricted to the following hours:
   1. Monday Through Saturday (Except Legal Holidays): 8:00 a.m. to 5:00 p.m.
   2. Sundays or legal holidays with written approval of the Owner.

E. Work Within Highway Rights-of-Way: In accordance with Division 01 Section "Regulatory Requirements."

F. Private Easements:
   1. The Owner will arrange for the necessary easements required for construction across privately owned land. The Contractor shall carry on the construction in such a manner as to cause a minimum of inconvenience to the occupants of the properties. Contractor shall notify Owner a minimum of 4 months in advance of any possible easement requirements. Easements from the State of Michigan or MDOT may require additional time to obtain.
   2. The Owner has obtained restricted easement agreements in some locations. The Contractor shall conduct the Contractor's operations on easements in such a manner as to comply with the conditions set forth in said easement agreements, which are on file with the Owner All easement conditions noted shall be accomplished by the Contractor's and shall be included in the Contract Price. The Contractor shall limit the Contractor's operations to the time of year or time of week required on certain easements, as noted in the easement agreements.
   3. Any agreement made by the Contractor with any property owner that extends the rights as granted under an easement obtained by the Owner or that provides for an additional easement shall be obtained by the Contractor at the Contractor's expense and shall in no way be binding upon the Owner. The Contractor shall defend and hold the Owner and the Engineer harmless against any action that may arise from activities conducted pursuant to such additional agreements or easements. Unless relieved of responsibility for surface restoration in writing by property owner, the Contractor shall restore areas covered by separate agreements substantially the same as similar areas within the Project.

1.9 OCCUPANCY REQUIREMENTS

A. Owner Occupancy During Construction:
   1. The Owner will occupy or utilize premises during entire period of construction, for conduct of the Owner's normal operations. Cooperate with the Owner and Engineer to minimize conflict and to facilitate the Owner's operations.
   2. Access to Abutting Properties: Provide at all times.
   3. Access for Emergency Vehicles:
      a. Provide at all times.
      b. Provide at least one clear lane during nonwork periods.
   4. Fire Hydrants: Provide access to at all times.
   5. Do not block fire access routes from buildings.
   6. Detours and Street Closure:
      a. When provided for in the Contract Documents or approved by the Owner.
      b. Routes and barricades as indicated or as approved by road authority.
   7. Limit parking for construction vehicles to an area designated by the Owner. See Division 01 Section "Regulatory Requirements."

1.10 WATER MAIN CONSTRUCTION SEQUENCING PLAN.

A. All water main shutdowns and tie-ins shall be coordinated and scheduled in a manner that carefully and considerately assures the minimum inconvenience of business and property owners.

B. Coordinate with Contractor completing the Iron Removal Plant (IRP) project.

1. Final tie-ins at the IRP and Well 2 must be coordinated with the City of Grand Ledge and the IRP Contractor.

PART 2 - PRODUCTS

2.1 OTHER MATERIALS

A. General: All other materials which are not specified herein and are not indicated on the Drawings, but are required for proper and complete performance of the Work.

B. Procedure:
1. Select new, first quality material.
2. Obtain Engineer's review.
3. Provide and install.

PART 3 - EXECUTION

Not used.

END OF SECTION 01 11 00

SECTION 01 12 23 – STAKING AND INSPECTION SERVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes staking and inspection services to be provided by Engineer and others.

1.3 PROJECT LAYOUT

A. Responsibilities:
   1. Engineer will furnish stakes as follows:
      a. For Water Mains and Pumping Mains, Line Stakes:
         1) At intervals of approximately 50 feet.
         2) At other locations generally required to aid the construction.
         3) Grades will be established at critical locations only.
      b. For Street, Line and Grade Stakes:
         1) At intervals of 50 feet.
         2) At all point of intersection, point of curvature and side street centerlines.
         3) As needed at critical locations.
   2. Provide Engineer 3 working days notice to schedule staking.

B. Expense:
   1. Staking described above will be authorized by and paid for by Owner.
   2. Restaking or staking in excess of that described above will be at the expense of Contractor.

1.4 CONSTRUCTION INSPECTION

A. By Fishbeck:
   1. Visits to the Site: In accordance with the General Conditions.
   2. Expense: Paid by Owner with amounts for additional inspection costs deducted from payment or payments to Contractor in accordance with Division 01 Section “Closeout Procedures.”

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION 01 12 23

SECTION 01 18 13 – PROTECTION, RESTORATION AND NOTIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes responsibilities for the protection, restoration and notification requirements for surface and subsurface structures, Underground Facilities and surface improvements.

1.3 NOTIFICATION AND INTERRUPTIONS

A. Prior to Start of Construction:
   1. Contact each utility owner.
   2. Arrange for the identification of the locations of existing Underground Facilities at or contiguous to the Site.
   3. Coordinate utility connection with each utility provider.

B. Utility Interruptions:
   1. Provide standby utility service for an interruption exceeding 2 hours.
   2. Provide 48 hours' notice to the affected occupants of the time and duration of the anticipated shut off.
   3. Notify Fire Department 48 hours in advance if water main or fire supply line shut off is required.
   4. Pay all costs relating to utility interruptions.

1.4 PROTECTION AND RELOCATION

A. Be Responsible For:
   1. Protection of structures and utilities at or contiguous to the Site in accordance with the General Conditions.
   2. Cost of cleaning, repair, relocation, raising, lowering, or replacement of structures and utilities which are damaged as a result of Contractor's operations.
   3. Cost of cleaning, repair, relocation, raising, lowering, or replacement of structures and utilities which are identified on the Drawings for relocation.
   4. Temporary sheeting, bracing, poles, cables, sand fill or other means used to support a structure or utility exposed or endangered by Contractor's operations.
   5. Relocating, raising or lowering of a structure or utility for Contractor's convenience.

B. Relocation of Poles and Structures:
   1. Be responsible for temporary and permanent relocation of power, light, telephone and other service poles and appurtenant structures that are identified on the Drawings for relocation.
   2. Make necessary arrangements with the owner of the pole or structure and pay all costs involved for items identified on the Drawings for temporary or permanent relocation.

1.5 RESTORATION

A. Acceptable Standards for Restoration:
   1. Restore to the better of:
      a. Original condition.
      b. Requirements of the Contract Documents.
      c. Current MDOT Standard Specifications for Construction.
      d. MDOT Standard Plans.

B. Property Corners, Government Survey Corners, and Plat Monuments:
   1. Protect from damage or disturbance.
   2. Protect discovered points until Engineer or Owner has witnessed or otherwise referenced their locations.

3. Replace if disturbed or removed as a result of construction:
   a. Arrange for replacement by a Licensed Land Surveyor.
   b. Pay all costs.

C. Driving Surfaces and Similar Improvements:
   1. Repair or replace damaged or removed surfaces as indicated on the Drawings and as specified herein.
   2. Adjust to temporary or final grade all new and existing castings (water valve boxes, manholes, catch basins and similar structures) for all gravel, bituminous or concrete surfacing or resurfacing.

D. Landscaping and Miscellaneous Improvements:
   1. Includes, but is not limited to, topsoil, seeded areas, sodded areas, shrubs, trees, decorative plantings, fences, mailboxes, signs, guard posts and other similar items.
   2. Protect from damage by construction operations. In event of damage, replace damaged item with one of equivalent type and size.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.1 SURFACE RESTORATION

A. Unless otherwise specified or indicated on the Drawings, perform the following surface restorations:
   1. System Descriptions:
      a. Bituminous Base Course - Bituminous Paved Roadway:
         1) Subbase: 6 inches.
         2) Bituminous Base Course:
            a) Collector Roadway: 6 inches.
            b) Local Roadway: 3 inches.
         3) Bituminous Leveling Course:
            a) Collector Roadway: 1-1/2 inches.
            b) Local Roadway: 1-1/2 inches.
         4) Bituminous Top Course: 1-1/2 inches.
      b. Aggregate Base Course - Bituminous Paved Roadway:
         1) Subbase: 8 inches.
         2) Aggregate Base Course:
            a) Collector Roadway: 12 inches.
            b) Local Roadway: 6 inches.
         3) Bituminous Leveling Course:
            a) Collector Roadway: 2 inches.
            b) Local Roadway: 1-1/2 inches.
         4) Bituminous Top Course: 1-1/2 inches.
      c. Bituminous Base Course - Bituminous Shoulders, Approaches, Driveways, Alleys, Parking Areas:
         1) Subbase: 4 inches.
         2) Bituminous Base Course: 3 inches.
         3) Bituminous Top Course: 1-1/2 inches.
      d. Aggregate Base Course - Bituminous Shoulders, Approaches, Driveways, Alleys, Parking Areas:
         1) Subbase: 4 inches.
         2) Aggregate Base Course: 6 inches.
         3) Bituminous Leveling Course: 1-1/2 inches.
         4) Bituminous Top Course: 1-1/2 inches.
      e. Concrete Sidewalks:
         1) Subbase: 4 inches.
         2) Concrete: 4 inches.
      f. Turf Establishment - Sodding and Seeding:
         1) Topsoil Thickness: 4 inches.
         2) Perform final grading, watering, backfilling of washouts, and related work.
         3) Sodded and seeded areas shall be weed free and established prior to acceptance.

g. Landscaping:
   1) New, transplanted, relocated, and removed and replanted items shall be healthy and growing prior to acceptance.
   2) Watering is Contractor's responsibility and an incidental expense.

2. Material requirements for surface restoration unless specified otherwise:
   a. Subbase: MDOT Granular Material Class II.
   b. Aggregate Base Course: MDOT Dense Graded Aggregate 22A.
   c. Bituminous Base Course: MDOT 13A
   d. Bituminous Leveling Course: MDOT 13A.
   e. Bituminous Top Course: MDOT 13A.
   f. Concrete Sidewalk: MDOT 35P.
   g. Turf Materials: MDOT 6.53.
   h. Landscaping Materials: MDOT 6.50.
   i. All Other Materials: Incidental and as required by Owner.
3. Construction Standards for Surface Restoration: Comply with MDOT construction requirements unless otherwise specified or indicated on the Drawings.

3.2 PAYMENT FOR UTILITIES AND ASSOCIATED STRUCTURES

A. Payment for Work on Utilities and Associated Structures:
   1. If Work is by Utility Company: Pay costs.
   2. If Work is by Contractor: Perform work in accordance with the requirements of utility company or authority having jurisdiction.

END OF SECTION 01 18 13

SECTION 01 21 13 – CASH ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section provides for cash allowances which are included in the Contract Price.

B. Related Sections include Sections in Divisions 01 through 49, as identified below, provide additional information on what is covered by the respective allowances.

1.3 ALLOWANCES

A. Include in the Contract Price the following amounts:

1. The amount of $40,000 for payment of testing services by the independent testing laboratory as specified in Division 01 Section “Testing Services for Buried Utilities, Roadways, and Site Projects.”
2. The amount of $100,000 for payment of Well 2 Electrical Improvements as specified in Division 26. The Owner will select the Electrical Contractor for this work item. The allowance is being utilized to allow flexibility and closer coordination of devices and implementation of the work. The intent is to utilize the same Electrical Contractor that will be working at the Iron Removal Plant (IRP) since this work potentially impacts operations at the IRP and within the Well 2 Wellhouse.

1.4 CASH ALLOWANCES

A. Costs Associated With Allowances:
1. All costs, associated with allowances, which are not specifically defined in the Schedule of Allowances, paragraph 1.3 of this Section shall be incidental to the major items of Work.
2. Associated costs not specifically defined in the Schedule of Allowances may include, but are not necessarily limited to:
    a. Unloading.
    b. Handling on the Site.
    c. Labor.
    d. Installation.
    e. Overhead.
    f. Profit.

1.5 ADJUSTMENT OF COSTS

A. Change Order: To adjust Contract Price if final cost is different from allowance.

B. Documentation:
1. Submit:
    a. Within 60 days after completion of the work under the allowance.
    b. Documentation of actual costs.
2. Failure to submit claims within the designated time will constitute a waiver of claims for additional costs.
3. At Contract closeout, reflect all approved changes in Contract amounts in the final statement of accounting.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION 01 21 13

SECTION 01 22 00 - UNIT PRICES - MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes descriptions of the method of measurement and the basis of payment for Unit Price Work under this Contract.

B. Basis of Contract Payments:
   1. Final Contract Price shall be determined by actual quantities installed at unit prices stated in Contractor's Bid.
   2. Engineer shall determine actual as-built quantities.
   3. All work identified on the Drawings, but not included as a Bid item shall be considered incidental to construction and not paid for directly, except Work that would be considered additional Work due to unforeseen conditions.
   4. Unit price payments for individual items shall include everything necessary for such item to function as intended in the system.
   5. Owner reserves the right to increase, decrease or eliminate any quantities for items listed in Contractor's Bid or which become a part of the Contract Documents.

C. Items included as incidental to Unit Prices for systems and appurtenances. Unless there is a specific pay item identified, the unit price payment shall include, but not be limited to:
   1. Clear, excavate, trench, bedding, trench backfill, compaction, disposal of items for clearing and unsuitable or excess excavated materials.
   2. Drainage of excavations including by-pass pumping of sewers if necessary**.**
   3. Temporary sheeting, bracing and shoring of excavations.
   4. Support, relocation, replacement, connection or reconnection of existing pipelines and utilities.
   5. Cleanup and surface restoration.
   6. Water service repair.
   7. Sewer lead repair.
   8. Bulk head of pipes to be abandoned.
   9. Removal of pipes, valves, structures and appurtenances located within the excavation limits of new utilities whether identified on the removal Drawing or not.
   10. Coordination of mail delivery and refuse removal with residents, post office, and refuse collectors.
   11. Dewatering for the installation of sanitary sewer, water main and storm sewer.
   12. Support of utility poles and existing underground utilities during excavation and installation of sanitary sewer, water main and storm sewer.
   13. Remove, salvage, and replace street signs.
   14. Remove and dispense of trees less than 6-inches in diameter.
   15. Protection of the work area including temporary fencing in park areas and other locations as necessary.

1.3 FISHBECK STANDARD PAY ITEMS - GENERAL REQUIREMENTS

A. Items for General Requirements include:

   1. Pay Item - Cash Allowance - Testing:
      a. Includes cash allowance for testing requirements in accordance with Division 01 Section "Testing Services for Buried Utilities, Roadways, and Site Projects."
      b. Unit of measure:
         1) Actual dollars paid to independent laboratory.
         2) General Contractor allowable mark-up is 10%.
         3) Documented by invoices.

2. Pay Item - Mobilization (5% Maximum of Total Bid):
   a. Includes:
      1) Preparatory work and expenses incurred prior to beginning work onsite.
      2) Transport materials, personnel, and equipment to the Site.
      3) Establish temporary onsite construction facilities.
      4) Provide insurance, bonds, and other costs associated with the project in general and not included in other pay items.
      5) All required submittals.
   b. Unit of Measure:
      1) Lump sum.
      2) 50% payment will be made after 5% of the original contract amount is earned.
      3) Final 50% payment will be made after 25% of the contract amount is earned.

3. Pay Item - Maintaining Traffic:
   a. Includes the following in accordance with Division 01 Sections "Summary of Work" and "Traffic Control:"
   b. Furnish, install, and maintain:
      1) Flag control.
      2) Detour signing.
      3) Work zone signing.
      4) Traffic control devices including barricades and barrels.
      5) Removal of conflicting pavement markings.
      6) Temporary pavement markings.
      7) Maintain access to residential driveways.
      8) Maintain access to commercial driveways.
      9) Temporary gravel as necessary to maintain driveway access.
   c. Unit of measure:
      1) Lump sum.
      2) 50% payment shall be made for installation of traffic control devices.
      3) 50% payment shall be made after removal of traffic control devices.

1.4 EXISTING CONDITIONS

A. Items for Existing Conditions include:

1. Pay Item - Preconstruction Video Documentation:
   a. Includes the following in accordance with Division 02 Section “Preconstruction Audio-Visual Documentation.”
      1) All DVD/Video CD disks.
      2) Reports.
   b. Measurement and Payment:
      1) Lump sum.
      2) Payment will be made after the Engineer has reviewed the audio-video documentation for completeness.

1.5 EARTHWORK

A. Items for Earthwork include:

1. Pay Item - Grading, Roadway:
   a. Includes the following in accordance with Division 31 Section "Grading:"
      1) Clear site and dispose of unsuitable materials within grading limits.
      2) Remove and stockpile topsoil.
      3) Cut, fill, shape, grade, compact, or otherwise prepare a finish subgrade.
      4) Proof roll subgrade to meet density requirements.
      5) Shape, grade, and compact onsite subbase material.
      6) Protect, salvage, or replace private irrigation systems in the project limits.
   b. Unit of Measure:
      1) Station.
      2) Measured along centerline of roadway only where roadway reconstruction work is occurring.

3) Is not paid where Horizontal Directional Drilling is occurring or in areas where only driveways or lawn restoration is occurring. .

2. Pay Item - Remove Concrete Curb and Gutter:
   a. Includes the following in accordance with Division 31 Sections "Grading" and "Excavation and Fill for Utilities."
      1) Sawcut, remove, and dispose of existing concrete curbs, integral curb and gutter, and gutter pans.
   b. Unit of Measure: Foot.

3. Pay Item - Remove Concrete Sidewalk and Drive Approaches:
   a. Includes the following in accordance with Division 31 Sections "Grading" and "Excavation and Fill for Utilities."
      1) Sawcut, remove, and dispose of existing concrete walks and drive approaches and remove base materials to obtain proposed grade.
   b. Unit of Measure: Square yard.

4. Pay Item - Remove Pavement, Full Depth:
   a. Includes the following in accordance with Division 31 Sections "Grading" and "Excavation and Fill for Utilities:"
      1) Sawcut, remove (full depth) and dispose of existing bituminous, concrete, and composite pavement materials.
   b. Unit of Measure: Square yard.

5. Pay Item - Remove Sewer Manhole, Valve Chamber or Catch Basin:
   a. Includes the following in accordance with Division 31 Section "Excavation and Fill for Utilities:"
      1) Excavate, remove and dispose of existing concrete or brick storm or sanitary sewer manholes or catch basins not within the excavation limits of new construction.
      2) Backfill and compaction.
   b. Unit of measure: Each.

6. Pay Item - Remove Tree _ to __-inch Diameter:
   a. Includes the following in accordance with Division 31 Section "Grading:"
      1) Remove trees, including stumps and roots, to 2 feet below finished grade, dispose of stumps and roots.
      2) Dispose of all tree material not specifically retained by property owner.
   b. The size of trees shall be determined by the average diameter of the tree trunk, measured to the nearest full inch, at a point 4-1/2 feet above the base of the tree from the ground line. Trees having major limbs lower than 4-1/2 feet from the ground shall be measured at the smallest diameter below such limbs.
   c. Does not include the removal of trees in designated clearing areas.
   d. Unit of Measure:
      1) Several trees originating from the same ground level trunk shall be measured separately.
      2) Each.

7. Pay Item – Clearing:
   a. Includes the following in accordance with Division 31 Section “Grading”
      1) Remove all plants, including shrubs, brush, trees and stumps in clearing area.
      2) Protect all vegetation not designated for removal adjacent to clearing area.
      3) Dispose of removed materials.
   b. Unit of Measure: Lump Sum

8. Pay Item - Remove, Salvage and Reinstall Sign:
   a. Includes the following in accordance with Division 31 Section “Grading”
      1) Remove and salvage signs and posts.
      2) Store and protect salvaged sign and sign posts.
      3) Furnish and maintain temporary regulatory signs.
      4) Reinstall salvaged sign and sign posts in accordance with the MUTCD
      5) Furnish and install new sign and sign posts to replace those damaged by construction or stolen.
   b. Unit of Measure: Each.

9. Pay Item - Soil Erosion and Sedimentation Control:
   a. Includes the following in accordance with Division 31 Sections "Erosion and Sedimentation Controls:"
      1) Review the soil erosion control plan and Soil Erosion Control Permit.
      2) Install and maintain the required soil erosion and sedimentation control measures as indicated on the Drawings and any other measure as necessary to adequately control soil erosion and sedimentation on the project.
      3) Submit copies of product information for all SESC BMP's.
      4) Submit Certificate of Certified Storm Water Operator.
      5) Organize and proceed over SESC Preconstruction Meeting. Provide inspections by a certified Storm Water Operator and submit reports until Notice of Termination is Issued.
      6) Maintain Storm Water Operators Log during construction and provide to Engineer at completion of project.
      7) Sweep and clean roadways and sidewalks as required.
      8) Maintain dust control.
      9) Maintain silt fence, catch basin inlet filters and all other BMP's as required.
      10) Clean new catch basins and storm sewers at the completion of construction if needed.
      11) Clean exiting catch basins and storm sewers near construction project if impacted by construction.
      12) Remove temporary soil erosion and sedimentation control measures after site is stabilized.
   b. Unit of Measure:
      1) Lump sum.
      2) 50% payment shall be made for installation of soil erosion and sedimentation control measures.
      3) 50% payment shall be made upon project completion after removal of soil erosion and sedimentation control measures.
      4) Payment for SESC measures beyond those identified on the Drawings required by Contractors operations will not be considered for additional payment.
      5) Payment for additional SESC measures required by Engineer will be administered through the Change Order process.

1.6 EXTERIOR IMPROVEMENTS

A. Items for Exterior Improvement Include:

1. Pay Item - Aggregate Base, __ inch:
   a. Includes the following in accordance with Division 32 Section "Aggregate Base Courses:"
      1) Furnish, place, and compact base material.
      2) Prepare subgrade.
      3) Proof roll subgrade.
      4) Furnish, place, and compact aggregate for bituminous or concrete pavement.
   b. Unit of measure: Square yard, compacted in place.

2. Pay Item - Curb and Gutter, Concrete:
   a. Includes the following in accordance with Division 32 Section "Concrete Curbs and Gutters:"
      1) Furnish and place concrete curb and gutter, gutter pans, curb radii.
      2) Provide longitudinal reinforcement.
      3) Provide lane ties where curb is adjacent to concrete paving.
   b. Unit of measure: Foot measured along the face of the curb, radii and gutter pans.

3. Pay Item - Driveway Approach, HMA:
   a. Includes the following in accordance with Division 32 Section “Asphalt Paving.”
      1) Prepare subgrade.
      2) Furnish, place, and compact base material to a minimum depth of 6 inches.
      3) Furnish and place HMA paving.
   b. Unit of measure: Ton.

4. Pay Item - Driveway Approach, Concrete, __-inch:
   a. Includes the following in accordance with Division 32 Section "Concrete Walks:"
      1) Prepare subgrade.
      2) Furnish, place, and compact base material to a minimum depth of 6 inches.

3) Furnish and place concrete paving.
4) Provide additional cement in mix for High Early concrete.

b. Unit of measure: Square foot.

5. Pay Item - Pavement, HMA 3C & 4C:
   a. Includes the following in accordance with Division 32 Section "Asphalt Paving:"
      1) Prepare aggregate base.
      2) Furnish, place, and compact bituminous leveling and top course mixture.
   b. Unit of measure: Ton.

6. Pay Item - Restoration, Lawn:
   a. Includes the following in accordance with Division 31 Sections "Grading" and Division 32 Section "Turf and Grasses:"
      1) Furnish, place, and grade topsoil.
      2) Place hydroseed.
      3) Place mulch and mulch anchoring.
      4) Maintain until final completion.
   b. Does not include restoration of any areas disturbed due to Contractor's operation that are outside the limits of normal construction.
   c. Unit of measure: Square yard

7. Pay Item - Sidewalk Ramp, Concrete, ADA:
   a. Includes the following in accordance with Division 32 Section "Concrete Walks:"
      1) Furnish and place EJIW Cast Iron Detectable Warning Strips (24-inch by 60-inch per ramp).
   b. Does not include concrete walk surrounding tactile warning plate. Surrounding concrete to be paid concrete sidewalk.
   c. Unit of measure: Square feet of tactile warning plate placed.

8. Pay Item - Sidewalk, Concrete __-inch:
   a. Includes the following in accordance with Division 32 Section "Concrete Walks:"
      1) Prepare subgrade.
      2) Furnish, place, and compact base material.
      3) Furnish and place concrete sidewalks.
      4) Provide additional cement for High Early strength concrete in concrete pours where drives must be open to traffic within 24 hours.
   b. Unit of measure: Square feet.

9. Pay Item - Subbase:
   a. Includes the following in accordance with Division 32 Section "Aggregate Base Courses:"
      1) Furnish, place, and compact subbase material.
      2) Prepare subgrade.
      3) Proof roll subgrade.
   b. Unit of measure: Cubic yard, compacted in place.

10. Pay Item - Tree, (Species), __-inch:
    a. Includes the following in accordance Division 32 Section "Planting."
       1) Furnish and install trees.
       2) Water and maintain trees until final completion.
    b. Unit of measure: Each.

11. Pay Item – Pavement Markings
    a. Includes the following in accordance with Division 32 Section “Pavement Markings”
       1) Furnish and place white or yellow pavement marking paint.
       2) Furnish and place cold plastic pavement markings.
    b. Unit of Measure: Lump Sum

1.7 UTILITIES - MISCELLANEOUS

A. Items for Miscellaneous Utilities include:

1. Pay Item - Casting, Manhole, Adjust:
   a. Includes the following in accordance with Division 33 Section "Storm Drainage Utilities:"
      1) Sawcut existing pavement, curb, and curb and gutter where required.
      2) Adjust the existing casting up or down to the finish grade.
      3) Remove and replace the pavement adjacent to the adjusted cover.
   b. Unit of Measure: Each.

2. Pay Item - Casting, Valve Box, Adjust:
   a. Includes the following in accordance with Division 33 Sections "Water Utilities":
      1) Sawcut existing pavement, curb, and curb and gutter where required.
      2) Adjust the existing casting up or down to the finish grade.
      3) Remove and replace the pavement adjacent to the adjusted cover.
   b. Unit of Measure: Each.

1.8 UTILITIES - WATER UTILITIES

A. Items for Water Utilities include:

1. Pay Item - Valve and Box, Gate, __-inch:
   a. Includes the following in accordance with Division 33 Section "Water Utilities:"
      1) Furnish and install valve and valve box adjusted to finished grade.
   b. Unit of Measure: Each.

2. Pay Item - Water Main Fitting, __-inch, DI:
   a. Includes the following in accordance with Division 33 Section "Water Utilities:"
      1) Furnish and install fitting and joint restraint.
   b. Unit of Measure:
      1) Each.
      2) Fitting size is determined by the largest diameter connection.
   c. Unit of Measure: Each.

3. Pay Item - Water Main Fitting, __-inch, HDPE:
   a. Includes the following in accordance with Division 33 Section "Water Utilities:"
      1) Furnish and install fitting.
   b. Unit of Measure:
      1) Each.
      2) Fitting size is determined by the largest diameter connection.

4. Pay Item – Water Main Fitting, HDPE to DI Transition:
   a. Includes the following in accordance with Division 33 Section “Water Utilities:”
      1) Furnish and install fittings to complete the transition.
      2) Heat fused HDPE transition.
      3) Stiffener spool on the inside of the HDPE.
      4) Mechanical joint connection to DI pipe or fitting
      5) Furnish and install concrete anchor.
   b. Unit of Measure:
      1) Each.
      2) Fitting size is determined by the largest diameter connection.

5. Pay Item - Water Main, __-inch, DI CL__:
   a. Includes the following in accordance with Division 31 Sections "Excavation and Fill for Utilities" and Division 33 Section "Water Utilities:"
      1) Furnish, install, and test water main.
      2) Excavate, backfill, and compact trench.
      3) Provide pipe bedding and trench backfill material.

b. Unit of Measure:
   1) Foot.
   2) Measure from center of fitting to center of fitting along centerline of pipe.

6. Pay Item - Water Main, __-inch, HDPE ____, Open-Cut:
   a. Includes the following in accordance with Division 31 Sections "Excavation and Fill for Utilities" and Division 33 Section "Water Utilities:"
      1) Furnish, install, and test water main.
      2) Excavate, backfill, and compact trench.
      3) Tracer wire.
      4) Provide pipe bedding and trench backfill material.
   b. Unit of Measure:
      1) Foot.
      2) Measure from center of fitting to center of fitting along centerline of pipe.

7. Pay Item – Water Main, __-inch, HDPE ____, HDD:
   a. Includes the following in accordance with Division 31 Sections “Excavation and Fill for Utilities” and Division 33 Sections "Utility Horizontal Directional Drilling” and “Water Utilities:”
      1) Excavation and backfill of boring and receiving pits.
      2) Water Main: Furnished and installed: High Density Polyethylene.
      3) Fusing and assembly and staging of pipe
      4) Barricading and protection of uninstalled pipe.
      5) Installation by horizontal directional drill methods.
      6) Determination of means and methods for completing the HDD installation including but not necessarily limited to, maintaining hole stability and pulling new pipe back through the hole while protecting all existing structures, pavement, and utilities.
      7) Locating potential utility crossing elevations of the HDD path and determining route to avoid damage to existing crossings.
      8) Tracer Wire
      9) Provide pipe bedding and trench backfill material.
      10) Testing
   b. Unit of Measure: Foot.
   c. Measure from center of fitting to center of fitting along centerline of pipe of installed and connected. Additional length of pipe for entrance and exit of bore is incidental and shall be included in the per foot cost.

8. Pay Item – Combination Valve and Chamber:
   a. Includes the following in accordance with Division 31 Sections “Excavation and Fill for Utilities” and Division 33 Sections and Division 40 “Combination Air Valves:”
      1) Furnish and install precast concrete structure, including steps, flow channel and pipe connections.
      2) Furnish and install casting, adjusted to finish grade.
      3) Furnish and install all water main fittings and mechanical joint restraints from HDPE Transition to HDPE Transition.
      4) Furnish, install and test combination valve.
      5) Furnish and install vent piping as identified on detail.
      6) Provide stone and geotextile fabric.
      7) Excavate, install foundation material, and backfill around catch basin.
      8) Provide resilient connector between pipe and manhole
      9) Provide pipe bedding and trench backfill material.
   b. Unit of Measure: Each.

1.9 UTILITIES - STORM DRAINAGE UTILITIES

A. Items for Storm Drainage Utilities include:

1. Pay Item - Catch Basin, __-foot diameter:
   a. Includes the following in accordance with Division 31 Section "Excavation and Fill for Utilities" and Division 33 Section "Storm Drainage Utilities:"
      1) Furnish and install precast concrete drainage structure, including steps, flow channel and pipe connections and sump.
      2) Furnish and install casting, adjusted to finish grade.
      3) Provide stone and geotextile fabric.
      4) Excavate, install foundation material, and backfill around catch basin.
      5) Provide resilient connector between pipe and manhole for all pipe diameters less than or equal to 24 inch.
   b. Unit of Measure: Each.

2. Pay Item - Storm Sewer, __-inch, C-76, CL__:
   a. Includes the following in accordance with Division 31 Section "Excavation and Fill for Utilities" and Division 33 Section "Storm Drainage Utilities:"
      1) Furnish and install and storm sewer.
      2) Excavate, backfill and compact trench.
      3) Provide pipe bedding and trench backfill material.
      4) Connect to existing storm sewer, including geotextile fabric wrap.
      5) Connect to existing storm structure.
   b. Unit of Measure:
      1) Linear foot.
      2) Measure from centerline of drainage structure to centerline of drainage structure or end of pipe along the centerline.

1.10 PROJECT SPECIFIC PAY ITEMS

A. Project Specific Items include:

1. Pay Item – Cash Allowance - Well 2 Electrical Improvements:
   a. Includes Cash Allowance for the following in accordance with Division 26 Specifications.
      1) Furnish, install and test all electrical items associated with Well 2 electrical improvements as identified in the drawings and details.
   b. Unit of Measure:
      1) Actual dollars paid to Electrical Integrator as selected by the Owner
      2) General Contractor allowable mark-up is 10%
      3) Documented by invoices

2. Pay Item - Settlement Monitoring:
   a. Includes the following in accordance with Division 01 Section “Monitoring of Existing Conditions”
      1) Preconstruction Survey.
      2) Installation of monitor points.
      3) Monitoring of settlement markers.
      4) Reporting.
      5) Removal of monitor points.
   b. Unit of Measure: Lump Sum.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION 01 22 00

SECTION 01 25 13 – PRODUCT SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the administration of substitutions and Product options.

1.3 SUBMITTALS

A. List of all products proposed for installation:
   1. Submit 5 copies within 30 days after the Effective Date of Agreement unless otherwise indicated elsewhere in the Contract Documents.
   2. Tabulate the list by each Specification Section.

1.4 CONTRACTOR'S OPTIONS

A. Products specified only by reference standards or by description:
   1. Select any Product meeting the standards or description by any Supplier unless otherwise required elsewhere in the Contract Documents.
   2. Submit for Engineer's review:
      a. Name and address of Supplier.
      b. Trade name.
      c. Model or catalog designation.
      d. Manufacturer's data including:
         1) Performance and test data
         2) Compliance with reference standards.

B. Products specified by naming one or more suppliers without an "or equal" clause:
   1. Use specified Product of one of the Suppliers named.
   2. No substitutions.

C. Products specified by naming one or more suppliers with an "or equal" clause:
   1. Indicates the option of selecting equivalent Products by stating "or equal" after the specified Suppliers.
   2. Engineer may waive some or all of the requirements specified for substitutions if, at Engineer's sole discretion, the proposed equivalent Product is considered an "or equal".
   3. If, at Engineer's sole discretion, the proposed equivalent Product does not qualify as an "or equal", it will be considered as a proposed substitute and a substitution request submittal will be required.

1.5 SUBSTITUTIONS

A. Substitutions after the effective date of agreement:
   1. Within 30 days after the Effective Date of Agreement.
   2. Engineer will consider formal requests for substitution of Products in place of those specified unless otherwise prohibited elsewhere in the Contract Documents.

B. Substitution Request Submittals: Submit 5 copies of the request for substitution including the following:
   1. Complete data substantiating compliance of the proposed substitution with the Contract Documents.
   2. For Products:
      a. Names and addresses of Manufacturer and Supplier.
      b. Product identification.
      c. Manufacturer's literature, including:
         1) Product description.
         2) Performance and test data

3) Reference standards.
d. Samples.
e. Name and address of similar projects on which the Product was used and date of installation.
3. For Construction Methods:
a. Detailed description of the proposed method.
b. Drawings illustrating methods.
4. Itemized comparison of proposed substitution with Product or method specified.
5. Data relating to changes in the construction schedule.
6. Accurate cost data on the substitution and comparison with the Product or method specified.
7. Changes to the Work which would be caused by the substitution.

C. Contractor's Responsibilities: In making a request for a substitution, Contractor represents:
1. Contractor has personally investigated the proposed Product or method and determined that it is equal or superior in all respects to that which is specified.
2. Contractor will provide the same guarantee for the substitution as for the Product or method specified.
3. Contractor will coordinate installation of the accepted substitution into the Work making such changes as may be required for the Work to be completed in all respects.
4. Contractor waives all claims for additional cost related to the substitution which consequently become apparent.
5. Cost data is complete and includes all related costs under Contractor's contract, but excludes costs under separate contracts and Engineer's redesign costs.

D. Substitutions Not Considered: Substitutions will not be considered if:
1. They are indicated or implied on Shop Drawings or Product data submittals without formal request submitted in accordance with this Section.
2. Acceptance will require substantial revision of the Contract Documents.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION 01 25 13

SECTION 01 26 00 – CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes procedures for modifying the Contract Documents.

1.3 BULLETIN

A. Procedures: As indicated on the form following this Section.

B. If Bulletin is accepted, Owner may issue one or more Change Orders for some or all items listed.

1.4 FIELD ORDER

A. Changes in Contract Price or Contract Times not permitted by use of Field Orders.

B. Format:
   1. May take form of any written communication mutually acceptable to Engineer and Contractor, including, but not necessarily limited to:
      a. Letter or memo.
      b. Email correspondence..
      c. Hand drawn or computer generated sketch.

C. Procedures: Refer to the General Conditions.

1.5 WORK CHANGE DIRECTIVE

A. Procedures: Refer to the General Conditions and form following this Section.

1.6 CHANGE ORDER

A. Procedures: Refer to the General Conditions and form following this Section.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.1 SCHEDULES

A. Attached are the following forms:
   1. Bulletin.
   2. Work Change Directive.
   3. Change Order.

BULLETIN
PAGE 1 OF 2

BULLETIN NO.:
DATE:
DUE DATE:

CONTRACT FOR:

OWNER:

CONTRACTOR:

ENGINEER:

DRAWING REVISION NO.:

ISSUED HEREWITH:

SPECIFICATION SECTIONS:

SKETCHES:

SHEETS:

The items below are being considered as possible changes to the Contract Documents for this Project. Contractor is requested to submit changes in cost, if any, for each item and indicate whether it is an addition to or deduction from the Contract Price. Costs are requested as lump sums unless otherwise noted as a unit cost. Include all labor, materials, overhead and profit, trades, subcontractors, and related costs. After reviewing the effects of those changes in the Work, Owner may issue a Change Order specifying which changes are to be incorporated in the Work, if any.

This Bulletin is not a Change Order and is not to be deemed authorization to proceed with the changes listed.

Additional work or materials, where proposed, shall meet the requirements of the Contract Documents, except where noted.

Contractor will be responsible for notifying Engineer, in writing, concerning any revision or clarification which causes a change in the Contract Documents, but not specifically mentioned as a cost item in this Bulletin.

Contractor shall return one (1) completed and signed copy of the Bulletin to Engineer on or before the due date noted above.

Each proposed change has been described briefly with additional information provided concerning detailed changes required for the major trades concerned. Only one total cost figure has been requested for each item on the Bulletin; however, a complete breakdown is required for each item as supporting documentation. This will allow Owner to more easily evaluate the proposed cost changes. Each Bulletin item is an all-inclusive item and may concern work from several trades or Subcontractors. It is Contractor's responsibility to ensure that all work for each item has been included in the total cost figure provided to Owner.

BULLETIN
PAGE 2 OF 2

ITEM NO. 1: < insert topic here >

Section: XXXXX – Section Name < issued/reissued/not reissued >

A. < >

ADD/DEDUCT: $ _____

ITEM NO. 2: < insert topic here >

Section: XXXXX – Section Name < issued/reissued/not reissued >

A. < >

ADD/DEDUCT: $ _____

ITEM NO. 3: < insert topic here >

Sheet: XXXXX – Sheet Name < issued/reissued/not reissued >

A. < >

ADD/DEDUCT: $ _____

ITEM NO. 4: < insert topic here >

Sheet: XXXXX – Sheet Name < issued/reissued/not reissued >

A. < >

ADD/DEDUCT: $ _____

Contractor:

_____
Signature

_____
Name and Title of Signatory

_____
Date

END OF BULLETIN

WORK CHANGE DIRECTIVE
PAGE 1 OF 1

WORK CHANGE DIRECTIVE NO.
DATE OF ISSUANCE:
EFFECTIVE DATE:

CONTRACT FOR:
OWNER:
CONTRACTOR:
ENGINEER:
ATTACHMENTS:
CONTRACTOR IS DIRECTED TO PROCEED PROMPTLY WITH THE FOLLOWING CHANGE(S) IN THE CONTRACT DOCUMENTS:

Authorization for Work described herein to proceed on the basis of Cost of the Work due to:

- ☐ Nonagreement on pricing of proposed change.
- ☐ Necessity to expedite Work described herein prior to changes on Contract Price and Contract Time.

Estimated change in Contract Price and Contract Times:

Contract Price _____ (increase/decrease) Contract Time (Days) _____ (increase/decrease)

Recommended for
Approval by Engineer: _____ Date: _____

Authorized for Owner by: _____ Date: _____

Received for Contractor by: _____ Date: _____

Received by
Funding Agency (if applicable): _____ Date: _____

END OF WORK CHANGE DIRECTIVE

WORK CHANGE DIRECTIVE INSTRUCTIONS

A. GENERAL INFORMATION:

This document was developed for use in situations involving changes in the Work which, if not processed expeditiously, might delay the Project. These changes are often initiated in the field and may affect the Contract Price or the Contract Times. This is not a Change Order, but only a directive to proceed with Work that may be included in a subsequent Change Order.

For supplemental instructions and minor changes not involving a change in the Contract Price or the Contract Times, a Field Order may be used.

B. COMPLETING THE WORK CHANGE DIRECTIVE FORM:

Engineer initiates the form, including a description of the items involved and attachments.

Once Engineer has completed and signed the form, all copies should be sent to Owner for authorization because Engineer alone does not have authority to authorize changes in Price or Times. Once authorized by Owner, a copy should be sent by Engineer to Contractor.

Once the Work covered by this directive is completed or final cost and times are determined, Contractor should submit documentation for inclusion in a Change Order. Price and Times may only be changed by Change Order signed by Owner and Contractor with Engineer's recommendation.

This is a directive to proceed with a change that may affect the Contract Price or the Contract Times. A Change Order, if any, should be considered promptly.

CHANGE ORDER
PAGE 1 OF 1

CHANGE ORDER NO.:
DATE:

CONTRACT FOR:
OWNER:
CONTRACTOR:
ENGINEER:
ATTACHMENTS:

Contractor shall indicate approval of Change Order through signing of this document and returning to Engineer. Engineer will forward to Owner, who shall indicate approval of Change Order through signing of this document and returning to Engineer. Upon receipt of fully executed (all signatures) Change Order, Engineer will distribute to all parties.

YOU ARE DIRECTED TO MAKE THE FOLLOWING CHANGES IN THE CONTRACT DOCUMENTS:

CHANGE IN CONTRACT PRICE:	CHANGE IN CONTRACT TIMES:
Original Contract Price:	Original Contract time:
	Substantial Completion:
$	Ready for final payment:
Previous Change Order No.:	Net change from previous Change Orders:
$	Days
Contract Price prior to this Change Order:	Contract Time prior to this Change Order:
	Substantial Completion:
$	Ready for final payment:
Net of this Change Order:	Net of this Change Order:
$	Days
Contract Price with all approved Change Orders:	Contract Time with all approved Change Orders:
	Substantial Completion:
$	Ready for final payment:

RECOMMENDED	APPROVED	APPROVED
By: _____	By: _____	By: _____
Engineer	Contractor	Owner
_____	_____	_____
Name and Title of Signatory	Name and Title of Signatory	Name and Title of Signatory
Date: _____	Date: _____	Date: _____

END OF CHANGE ORDER

CHANGE ORDER INSTRUCTIONS

A. GENERAL INFORMATION:

This document was developed to provide a uniform format for handling contract changes that affect Contract Price or Contract Times. Changes that have been initiated by a Work Change Directive must be incorporated into a subsequent Change Order if they affect Contract Price or Contract Times.

Changes that affect Contract Price or Contract Times should be promptly covered by a Change Order. The practice of accumulating Change Order items to reduce the administrative burden may lead to unnecessary disputes.

If Milestones have been listed in the Agreement, any effect of a Change Order thereon should be addressed.

For supplemental instructions and minor changes not involving a change in the Contract Price or Contract Times, a Field Order may be used.

B. COMPLETING THE CHANGE ORDER FORM:

Engineer normally initiates the form, including a description of the changes involved and attachments based upon documents and proposals submitted by Contractor, or requests from Owner, or both.

Once Engineer has completed and signed the form, all copies should be sent to Contractor for acceptance. After acceptance by Contractor, all copies should be sent to Owner for acceptance. Engineer should make distribution of executed copies after approval by Owner.

If a change only applies to Contract Price or to Contract Times, indicate "N/A" (Not Applicable) in the part of the tabulation that does not apply.

Net “Increase” or “Decrease” in Price and Days should be included as applicable term.

END OF SECTION 01 26 00

SECTION 01 26 13 – REQUESTS FOR INFORMATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes procedures for Contractor to give notice of conflicts, errors, ambiguities, or discrepancies in the Contract Documents.

1.3 DEFINITIONS

A. Abbreviation: Request for Information (RFI).

1.4 REQUESTS FOR INFORMATION

A. Format:
   1. Use the enclosed RFI form or, at Contractor's option, generate form.
   2. Minimum required content of Contractor's RFI form:
      a. Project name.
      b. Name and address of Contractor.
      c. RFI number.
      d. RFI date.
      e. Name of initiator.
      f. Complete written request, with sketches as required.
      g. Signature of initiator.
      h. Space for written response by Engineer, with signature and date of Engineer's representative.

B. Procedures:
   1. Maintain a log of RFIs, including the RFI date and the date of the response.
   2. Allow at least 15 full working days for Engineer's response following Engineer's receipt of RFI.
   3. Submit written justification for shorter response time.
   4. Do not submit RFIs for information already included in the Contract Documents.
   5. Illegitimate RFIs may be cause for deductions in the Contract amount. See the Supplementary Conditions.
   6. RFIs submitted directly by subcontractors or vendors will be rejected.
   7. Changes in Contract Price or Contract Times not permitted within an RFI form.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.1 SCHEDULES

A. Attached is the following form:
   1. Request for Information.

REQUEST FOR INFORMATION
PAGE 1 OF 1

CONTRACT FOR:	PROJECT NO.:
OWNER:	
CONTRACTOR:	
ENGINEER:	

THE CONTRACTOR SHALL COMPLY WITH THE PROCEDURES IN DIVISION 01 SECTION “REQUESTS FOR INFORMATION.”

RFI No.: _____

Fishbeck Project Manager: _____

REQUEST		
RFI From:	**Signature:**	**Date:**

RESPONSE		
Response From:	**Signature:**	**Date:**

END OF SECTION 01 26 13

SECTION 01 29 16 – PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes submittal to the Owner's designee of Applications for Payment and supporting documentation as specified herein.

1.3 SUBMITTALS

A. Application for Payment: Submit an electronic copy.

B. An incomplete or incorrect Application for Payment will constitute reason for refusing to recommend payment as indicated in Article 14 of the General Conditions.

1.4 FORMS

A. Copies of the forms to be used for the above requirements are attached and include the following:
   1. Application for Payment.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

APPLICATION AND RECOMMENDATION FOR PAYMENT
PAGE 1 OF 3

TO: City of Grand Ledge
In Care of: Fishbeck
1515 Arboretum Drive, SE
Grand Rapids, MI 49546

FROM (Contractor): _____

Application No: _____
Period From: _____
To: _____

Project: Well 2 Raw Water Main
Fishbeck Project Number: 221916

APPLICATION FOR PAYMENT:

Application for Payment is made, as indicated below, in connection with the Contract. Schedule of Values sheet is attached as page 3 of 3.

1. Original Contract Price $_____

2. Net change by Change Orders $_____

3. Current Contract Price (1 plus 2) $_____

4. Total Completed and Stored to Date (Column F) $_____

5. Retainage (Per Agreement) _____% of Work Completed: $_____
_____% of Stored Material: $_____
Total Retainage (Equal to Column H) $_____

6. Amount Eligible to Date (4 minus 5) $_____

7. Less Previous Payments $_____

8. Amount Due This Application (6 minus 7) $_____

9. Balance to Finish, Plus Retainage (Column G plus 5) $_____

CHANGE ORDER SUMMARY:

Change Orders Approved by Owner	ADDITIONS	DEDUCTIONS
Change Order No. 1 Change Order No. 2 Change Order No. 3 Change Order No. 4 Change Order No. 5		
Net Change by Change Orders		

APPLICATION AND RECOMMENDATION FOR PAYMENT
PAGE 2 OF 3

CONTRACTOR'S CERTIFICATION:

The undersigned Contractor certifies that to the best of its knowledge (1) all previous progress payments received from Owner on account of Work done under the Contract have been applied on account to discharge Contractor's legitimate obligations incurred in connection with Work covered by prior Applications for Payment; (2) title of all Work, materials and equipment incorporated in said Work or otherwise listed in or covered by this Application for Payment will pass to Owner at time of payment free and clear of all Liens, security interests and encumbrances (except such as are covered by a bond acceptable to Owner indemnifying Owner against any such Liens, security interest or encumbrances); and (3) all Work covered by this Application for Payment is in accordance with the Contract Documents and is not defective.

Dated _____, 20___

_____
Contractor

By _____
(Signature)

_____
Name and Title of Signatory

ENGINEER'S RECOMMENDATION:

To: **City of Grand Ledge**

In accordance with the Contract, the undersigned recommends payment to Contractor.

AMOUNT RECOMMENDED: .....$_____
(Attach explanation if amount recommended differs from the amount applied for.)

ENGINEER: Fishbeck

Dated _____, 20___

By _____
(Signature)

_____
Name and Title of Signatory

This Recommendation is not negotiable. The AMOUNT RECOMMENDED is payable only to Contractor named herein. Issuance, payment and acceptance of payment are without prejudice to any rights of Owner or Contractor under this Contract.

This recommendation for payment is based on a review of the Work performed as compared to the amount of the application. This recommendation does not imply that Engineer is reviewing construction lien documents nor does it imply that Engineer is acting as a guarantor of the property. Any review of construction lien documents by Engineer is for information purposes only.

Schedule of Values

	A	B	C	D	E	F		G	H
SPEC. ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	WORK COMPLETED			TOTAL COMPLETED AND STORED TO DATE (C+D+E)	% (F/B)	BALANCE TO FINISH (B-F)	RETAINAGE
			From Previous Applications (C + D)	This Period					
				Work in Place	Presently Stored Materials (not in C or D)				

In tabulations above, amounts are stated to the nearest dollar.
Attach additional copies of Page 3 as required. Total on the last page.

END OF SECTION 01 29 16

SECTION 01 31 19 – PROJECT MEETINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes scheduling and administering of preconstruction and progress meetings.

B. Scheduling and Administration of Meetings:
   1. Responsibility:
      a. Preconstruction Meeting: Engineer.
      b. Progress Meetings: Contractor.
   2. Procedures:
      a. Prepare agenda.
      b. Distribute written notice and agendas of meetings 4 days in advance of the meeting date.
      c. Make physical arrangements for the meetings.
      d. Preside at meetings.
      e. Record minutes and include significant proceedings and decisions.
      f. Distribute copies of the minutes within 4 days after meetings to:
         1) Participants.
         2) Others affected by proceedings.

1.3 PRECONSTRUCTION MEETING

A. Schedule: Preconstruction meeting will be scheduled by Engineer:
   1. Within 20 days after the Effective Date of Agreement.
   2. Before starting the Work at the Site.

B. Attendance: Representatives of the following parties are to be in attendance at the meeting:
   1. Owner.
   2. Engineer.
   3. Contractor.
   4. Major Subcontractors.
   5. Governmental or regulatory agencies when appropriate.
   6. Utility companies.
   7. The following should be invited to send representatives:
      a. Police Department.
      b. Carriage Tours.
      c. Gough Carriages.

1.4 PROGRESS MEETINGS

A. Types of Progress Meetings:
   1. Regular.
   2. Called.
   3. Preinstallation.

B. Schedule meetings as follows unless otherwise approved by Engineer:
   1. Regular: Bi-weekly.
   2. Called: As the progress of the Work dictates.
   3. Preinstallation: At least 20 working days prior to start of installation.

C. Location: Hold meetings at site, virtual, or as indicated in the notice.

D. Attendance: Representatives of the following parties are to be in attendance at the meeting:
   1. Engineer.
   2. Contractor.
   3. Major Subcontractors as pertinent to the agenda.
   4. Owner's representative as appropriate.
   5. Governmental or other regulatory agencies as appropriate.

E. Minimum Agenda: The minimum agenda for progress meetings shall consist of the following:
   1. Review and approve minutes of previous meetings.
   2. Review progress of the Work since the previous meeting.
   3. Note field observations, problems and decisions.
   4. Identify problems which impede planned progress.
   5. Review offsite fabrication problems.
   6. Develop corrective measures and procedures to regain plan schedule.
   7. Revise construction schedule as indicated.
   8. Review submittal schedules; expedite as required to maintain schedule.
   9. Maintenance of quality and work standards.
   10. Review changes proposed by Owner for their effect on the construction schedule and completion date.
   11. Identify all claims and potential claims.
   12. Pending changes and substitutions.
   13. Complete other current business.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION 01 31 19

SECTION 01 32 16 – CONSTRUCTION PROGRESS SCHEDULE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the preparation, furnishing, distribution and periodic revision of construction progress schedules.

PART 2 - PRODUCTS

2.1 FORM OF SCHEDULE

A. Preparation:
   1. Prepare in the form of a horizontal bar chart, CPM network, or other form as previously approved by Engineer.
   2. Provide a separate horizontal bar column or path for each trade or operation.
   3. Prepare the schedule in the chronological order of the beginning of each item of work.
   4. Identify each column or path by:
      a. Major Specification Section number.
      b. Distinct graphic delineation.
   5. Use a horizontal time scale and identify the first work day of each week.
   6. Allow space for updating.

B. Size: The schedule sheets shall be 11 inches x 17 inches unless otherwise approved by Engineer.

2.2 CONTENT OF SCHEDULES

A. Construction Sequence:
   1. Provide a complete sequence of construction by activity identifying work of separate stages and Milestones.
   2. For Shop Drawings, project data and Samples indicate the following:
      a. Submittal dates.
      b. Dates review copies will be required.
   3. Show decision dates for selection of finishes.
   4. Show Product procurement and delivery dates .
   5. Show dates for beginning and completion of each element of construction.

B. Percentage Completion: Show the projected percentage of completion for each item of work as of the first day of each month.

C. Subschedules:
   1. Provide separate subschedules showing submittals, review times, procurement schedules and delivery days.
   2. Provide subschedules to define critical portions of the entire schedule.

PART 3 - EXECUTION

3.1 SUBMITTALS

A. Preliminary Schedule:
   1. Submit the preliminary schedule within 10 days after the Effective Date of Agreement.
   2. Engineer will review schedules and will return the reviewed copy within 15 days after receipt.

3. If required, resubmit within 7 days after receipt of a returned review copy.
4. Meet with Engineer at least 10 days prior to the submission of the first Application for Payment to review the schedule.

B. Periodic Adjustment: Monthly, submit a revised schedule accurately depicting adjustments and progress to the first day of each month.

C. Number of Copies: Submit the number of copies required by Contractor, plus 4 copies to be retained by Engineer.

3.2 DISTRIBUTION

A. Reviewed Schedules: Distribute copies of the reviewed schedules to the following:
1. Job Site file.
2. Subcontractors.
3. Other concerned parties.

B. Instructions to Recipients: Instruct recipients to report all inability to comply with the schedule, and provide detailed explanations with suggested remedies.

3.3 ADJUSTMENT OF PROGRESS SCHEDULE

A. Changes: Show all changes occurring since previous submission of the schedule.

B. Progress: Indicate progress of each activity and show completion dates.

C. Other Items:
1. Include major changes in scope.
2. Include activities modified since previous updating.
3. Include revised projections due to changes.
4. Include other identifiable changes.

D. Narrative Report: Provide a narrative report including:
1. A discussion of problem areas including current and anticipated delay factors and their impact.
2. Direct action taken, or proposed, and its effect.
3. A description of revisions including:
   a. Their effect on the schedule due to change of scope.
   b. Revisions in duration of activities.
   c. Other changes that may affect the schedule.
4. The status of completion of Milestones.

END OF SECTION 01 32 16

SECTION 01 33 00 – SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes procedures for the submittal of Shop Drawings, Product Data, Samples, Operation and Maintenance Manuals, and other information.

B. Related Sections include pertinent Sections of these Specifications for the individual Submittals required.

1.3 DEFINITIONS

A. Submittal: Information sent by Contractor to convey information about systems, equipment, materials, products, and administrative matters for the Work.

B. Resubmittal: Submittal sent for review a second or further time.

C. Product Data: Illustrations, standard schedules, diagrams, performance charts, instructions, brochures, or manufacturer's literature that describe the physical size, appearance, and other characteristics of materials or equipment for a portion of the Work.

D. Shop Drawings: Drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.

E. Samples: Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.

F. Action Submittals: Submittals that require Engineer's response.

G. Informational Submittals: Submittals that do not require Engineer's response.

H. Delegated-Design: In certain individual Specification Sections, design services or certifications by a design professional that are specifically delegated to the Contractor. Performance and design criteria are defined in the individual Specification Sections or on the Drawings. Contractor is solely responsible for design of those items or systems, coordination of the design with the balance of the Project, and achieving specified performance.

I. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format. All PDF files shall be searchable.

1.4 SUBMITTAL PROCEDURES

A. Submittal Schedule:
   1. Prepare and submit a Submittal schedule that identifies the following for each Submittal:
      a. Submittal number
      b. Submittal description
      c. Projected date Submittal will be submitted.
   2. An electronic copy (MS Excel file) of a blank Submittal schedule, in the preferred format, will be furnished by Engineer at the preconstruction meeting.

3. Submittal Numbers:
    a. Use the applicable Specification Section number followed by a decimal point and then a sequential number (e.g., 06 10 00.1). Where a Submittal is required via a Drawing (instead of a Specification Section), use the applicable Drawing Number followed by a decimal point and then a sequential number (e.g., M501.1.1).
    b. Resubmittals shall include a letter suffix after another decimal point (e.g., 06 10 00.1.A).
    c. Submittals that are not numbered correctly may be rejected.

B. Delivery Method:
1. Web-Based Collaboration and Document Sharing System:
    a. A web-based collaboration and document sharing system may be utilized at Contractor's, Owner's, or Engineer's option.
    b. Use of such a system will be discussed during the preconstruction meeting.
    c. All parties must agree on use of a web-based collaboration and document sharing system.
    d. Training and licensing will be provided for all parties by the party suggesting use of a web-based collaboration and document sharing system.
2. Where a web-based collaboration and document sharing system is not utilized, Submittals may be delivered as paper copies or electronic files at Contractor's option; except for Operation and Maintenance Manuals, which shall be delivered as specified herein.
3. Advise Engineer and Owner of delivery method to be used at the preconstruction meeting.
4. Where Submittals include information that is intended to be printed on sheets larger than 11 inches x 17 inches, or where scale or drawing size are critical for proper review, submit 2 paper copies for review.
5. Paper Copies:
    a. Unless indicated otherwise, submit 2 copies of each Submittal.
    b. One copy of each Action Submittal will be returned to Contractor.
    c. Extra copies submitted by Contractor will be discarded.
6. Electronic Files:
    a. Unless indicated otherwise, submit 1 copy of each Submittal in PDF format.
    b. Scanned Submittals shall be produced in such a way as to not compromise the graphic quality or accuracy of scale, where applicable; and text shall be searchable.
    c. One copy of each Action Submittal will be returned to Contractor.
    d. Transmit Submittals via electronic mail (e-mail) or web-based collaboration and document sharing system, where used. Submittals that are transmitted electronically will be returned electronically.
7. Transmit Submittals to party and address identified by Engineer at preconstruction meeting.

C. Coordination and Timing: Coordinate preparation and processing of Submittals with performance of construction activities. Contractor is responsible for cost of delays caused by lack of coordination or tardiness of Submittals. Incomplete Submittals will be rejected.
1. Coordinate each Submittal with fabrication, purchasing, testing, delivery, other Submittals, and related activities that require sequential activity.
2. Coordinate transmittal of different types of Submittals for related parts of the Work so processing will not be delayed because of need to review Submittals concurrently for coordination.
    a. Engineer reserves the right to withhold action on a Submittal requiring coordination with other Submittals until related Submittals are received.

D. Processing Time: Allow 15 full working days for Engineer to review each Submittal, including Resubmittals. Time for review shall commence on Engineer's receipt of Submittal. No extension of the Contract Time will be authorized because of failure to transmit Submittals enough in advance of the Work to permit processing, including Resubmittals. Engineer will advise Contractor when a Submittal being processed must be delayed for coordination.

E. Identification: Place a permanent label on each Submittal or generate a separate cover sheet.
1. Indicate name of firm or entity that prepared Submittal.
2. Provide space to record Contractor's review and approval markings and action taken by Engineer.
3. Include the following information:
    a. Project name.
    b. Date.
    c. Name and address of Engineer.
    d. Name and address of Contractor.
    e. Name and address of Subcontractor(s).
    f. Name and address of Supplier(s).

g. Name of Manufacturer.
h. Submittal number, including revision identifier.
i. Drawing number and detail references, as applicable.
j. Location(s) where product is to be installed, as applicable.
k. Other necessary identification.

F. Deviations: Encircle or otherwise specifically identify deviations from the Contract Documents on Submittals. Submittals that include deviations that are not identified may be rejected. Engineer may or may not consider deviations. Deviations are not substitutions. Refer to Division 01 Section “Product Substitution Procedures” for procedures regarding requests for substitutions.

G. Transmittal: Package each Submittal individually and appropriately for transmittal and handling. Transmit each Submittal using a transmittal form. Engineer will reject Submittal(s) received from sources other than Contractor.

H. Resubmittals: Make Resubmittals in same form and number of copies as initial Submittal.
1. Note date and content of previous Submittal.
2. Clearly identify additions and revisions.
3. Resubmit Submittals until they are marked, “Reviewed, No Exceptions Noted” or “Reviewed With Corrections Noted.”

I. Distribution: Furnish copies of Submittals with mark indicating, “Reviewed, No Exceptions Noted” or “Reviewed With Corrections Noted,” to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities.

J. Use for Construction: Unless otherwise indicated by Engineer, use only Submittals with mark indicating, “Reviewed, No Exceptions Noted” or “Reviewed With Corrections Noted.”

1.5 CONTRACTOR'S USE OF ENGINEER’S ELECTRONIC DRAWING FILES

A. At Contractor's written request, copies of Engineer’s electronic Drawing files may be provided to Contractor for Contractor's use in connection with Project, including Submittal preparation. Electronic files may be furnished by Engineer for the convenience of the Contractor. Conclusions or information obtained or derived from such electronic files will be at the Contractor’s sole risk. Materials furnished by Engineer that may be relied upon are limited to printed Contract Documents.

B. When Contractor uses Engineer’s electronic Drawing files to facilitate Submittal preparation, prepare Submittals to be project specific. Submittals that are not project specific, including Engineer’s Drawing files submitted on a new title block, will be rejected.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

A. General: Prepare and submit project specific Action Submittals required by individual Specification Sections. Do not use highlighting that would not be reproducible. Include a table of contents or index with each Submittal. As part of electronic submittals, the table of contents or index shall include electronic bookmarks to the first page of the respective Section(s) identified.

B. Product Data: Collect information into a single Submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for Submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each Submittal to indicate which products and options are applicable.
3. Include the following information, as applicable:
a. Manufacturer's written recommendations.
b. Manufacturer's product specifications.
c. Manufacturer's installation instructions.
d. Color charts as required by individual Specification Sections.
e. Manufacturer's catalog cuts.

f. Wiring diagrams showing factory-installed wiring.
g. Printed performance curves.
h. Operational range diagrams.
i. Mill reports.
j. Standard product operation and maintenance manuals.
k. Compliance with specified referenced standards.
l. Testing by recognized testing agency.
m. Application of testing agency labels and seals.
n. Notation of coordination requirements.

4. Submit Product Data before or concurrent with Samples.
5. Maintain copy of returned Submittal for Project records.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale where appropriate. Scale shall be sufficiently large to indicate pertinent features of the item and its method of connection to the Work.
1. Preparation: Fully illustrate requirements of the Contract Documents. Include the following information, as applicable:
a. Dimensions.
b. Identification of products.
c. Fabrication and installation drawings.
d. Colors and materials as applicable.
e. Roughing-in and setting diagrams.
f. Wiring diagrams showing field-installed wiring, including power, signal, control, and communication wiring. Differentiate between Manufacturer-installed and field-installed wiring.
g. Manufacturing instructions.
h. Templates and patterns.
i. Schedules.
j. Calculations.
k. Compliance with specified standards.
l. Notation of coordination requirements.
m. Notation of dimensions established by field measurement.
n. Relationship to adjoining construction clearly indicated.
2. Sheet Size: Submit Shop Drawings on sheets at least 8-1/2 inches x 11 inches but no larger than 24 inches x 36 inches.
3. Maintain copy of returned Submittal for Project records.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements, and for a comparison of these characteristics between Submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components, such as accessories, together in one Submittal package.
2. Identification: On unexposed side of Samples, attach label that includes the following:
a. Generic description of Sample.
b. Product name and name of Manufacturer.
c. Sample source.
d. Number and title of appropriate Specification Section.
3. Samples for Initial Selection: Submit Manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available. Where Contract Documents indicate custom color or material, coordinate production of custom Samples with the Engineer and Manufacturer prior to submittal.
a. Number of Samples: Unless indicated otherwise, submit 2 full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from Manufacturer's product line. Engineer will return 1 Sample with options selected.
4. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, physically identical with material or product proposed for use, and that show full range of color and texture variations expected.
5. Samples include, but are not limited to, the following: Partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

6. Number of Samples: Unless indicated otherwise, submit 2 sets of Samples. Engineer will retain 1 Sample set; remainder will be returned.
   a. Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
   b. If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
7. Disposition: Maintain sets of approved Samples at Site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used by Engineer to determine final acceptance of construction associated with each set.
   a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples shall be in an undamaged condition at time of Substantial Completion.
   b. Samples not incorporated into the Work, or otherwise designated to become Owner's property, are the property of Contractor.

E. Operation and Maintenance Manuals:
   1. General:
      a. Where manuals are required to be submitted covering items included in the Work, prepare such manuals in durable plastic binders approximately 8-1/2 inches x 11 inches in size and with at least the following:
         1) Identification on, or readable through, the front cover stating general nature of the manual.
         2) Include a table of contents or index with each Submittal, near the front of the manual. As part of electronic submittals, the table of contents or index shall include electronic bookmarks to the first page of the respective Section(s) identified.
         3) Complete instructions regarding operation and maintenance of equipment involved, including:
            a) Equipment function, normal operating characteristics, and limiting conditions.
            b) Assembly, installation, alignment, adjustment, and checking instructions.
            c) Operating instructions for start-up, routine and normal operating, regulation and control, shutdown, and emergency conditions.
            d) Maintenance instructions, including lubrication requirements where applicable.
            e) Guide to "troubleshooting".
            f) Parts lists and predicted life of parts subject to wear.
            g) Project specific outline and cross sections, assembly drawings, engineering data, and wiring diagrams. Wiring diagrams shall reflect final, as-installed conditions and include wire numbers.
            h) Test data and performance curves.
         4) Complete nomenclature of all replaceable parts, their part numbers, current costs, and name and address of nearest vendor of parts.
         5) Copies of guarantees and warranties issued.
         6) Copies of the reviewed Submittals.
         7) Copies of data concerning changes made during construction.
   2. Extraneous Data: Where contents of the manuals include Manufacturer's catalog pages, clearly indicate the precise items included in this installation and delete all Manufacturers' data with which this installation is not concerned. Do not use highlighting that would not be reproducible.
   3. Number of Copies Required: Unless otherwise specifically directed by Engineer, or stipulated in the pertinent Section of these Specifications:
      a. For review, submit an electronic copy.
      b. For record, deliver 2 paper and 1 electronic copies to Owner.
   4. Schedule delivery of record copies of operation and maintenance manuals at least 60 days prior to startup of respective equipment, unless otherwise specified.

2.2 INFORMATIONAL SUBMITTALS

A. General: Prepare and submit Informational Submittals required by individual Specification Sections. Do not use highlighting that would not be reproducible. Include a table of contents or index with each Submittal. As part of electronic submittals, the table of contents or index shall include electronic bookmarks to the first page of the respective Section(s) identified.

B. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

C. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects/engineers and owners, and other information specified.

D. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.

E. Installer Certificates: Prepare written statements on Manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by Manufacturer for this Project.

F. Manufacturer Certificates: Prepare written statements on Manufacturer's letterhead certifying that Manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

G. Product Certificates: Prepare written statements on Manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

H. Material Certificates: Prepare written statements on Manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

I. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

J. Product Test Reports: Prepare written reports indicating current product produced by Manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by Manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

K. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
   1. Name of evaluation organization.
   2. Date of evaluation.
   3. Time period when report is in effect.
   4. Product and manufacturers' names.
   5. Description of product.
   6. Test procedures and results.
   7. Limitations of use.

L. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

M. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

N. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

O. Manufacturer's Instructions: Prepare written or published information that documents Manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of Manufacturer. Include the following, as applicable:
   1. Preparation of substrates.
   2. Required substrate tolerances.
   3. Sequence of installation or erection.
   4. Required installation tolerances.
   5. Required adjustments.
   6. Recommendations for cleaning and protection.

P. Manufacturer's Field Reports: Prepare written information documenting tests and inspections of factory-authorized service representative. Include the following, as applicable:
   1. Name, address, and telephone number of factory-authorized service representative making report.
   2. Statement of substrate condition and acceptability of substrate for installation or application of product.
   3. Statement that products at Site comply with requirements.
   4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
   5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
   6. Statement whether conditions, products, and installation will affect warranty.
   7. Document settings in writing.
   8. Other required items indicated in individual Specification Sections.

Q. Safety Data Sheets (SDSs): Submit information directly to Owner; do not submit to Engineer.
   1. Engineer will not review Submittals that include SDSs and will return the entire Submittal for Resubmittal.

2.3 DELEGATED-DESIGN SUBMITTALS

A. Where design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated, which Contractor has coordinated with the balance of the Project.

B. Performance type design documents and calculations shall be prepared by a design professional as required by the individual Specification Section, licensed in the State where the Project is being constructed. Design documents shall be signed and sealed by the responsible design professional. Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Identify name and version of software, if any, used for calculations.

C. In addition to Shop Drawings, Product Data, and other required Submittals, submit two copies of a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Review each Submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Verify field dimensions and conditions; note corrections as necessary. Mark with approval stamp before submitting to Engineer.
   1. Approval Stamp: Stamp each Submittal with an approval stamp. Use the same stamp format for each Submittal. Include Project name and location, Submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that Submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

B. Submittals that are not approved and stamped by Contractor will be rejected.

3.2 ENGINEER'S REVIEW

A. Action Submittals: Engineer will review Action Submittals, make marks to indicate corrections or modifications required, and return Submittal. Engineer will stamp each Submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:
   1. Reviewed, No Exceptions Noted: Submittal appears to conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
   2. Reviewed With Corrections Noted: Upon incorporation of review comments, it appears that Submittal will conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
   3. Revise and Resubmit: Submittal has one or more specific segments that are incomplete, do not appear to conform to the information given in the Contract Documents, or are incompatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Contractor shall resubmit information for review to demonstrate understanding of comments and portions of Work to be provided. Except as noted, Contractor shall not proceed with Work related to Submittal.
   4. Rejected, Resubmit: Submittal as a whole is incomplete, does not appear to conform to the information given in the Contract Documents, or is incompatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Contractor shall resubmit information for review to demonstrate understanding of comments and portions of Work to be provided. Contractor shall not proceed with Work related to Submittal.

B. Informational Submittals: Other Submittals required by the Contract Documents are for information only. Engineer will acknowledge receipt of Informational Submittals. Such Submittals include, but are not limited to:
   1. Qualifications Data.
   2. Certificates.
   3. Test Reports.
   4. Manufacturer's Instructions.
   5. Maintenance Data.
   6. Field Reports.

C. Delegated-Design Submittals: Review of Delegated-Design Submittals by Engineer shall not relieve Contractor of Contractor's sole responsibility for design and achieving specified performance.

D. Submittals not required by the Contract Documents will be returned without being reviewed.

E. Partial Submittals are not acceptable, will be considered non-responsive, and will be rejected.

3.3 RE-REVIEW COSTS

A. Compensation:
   1. Should Engineer be required to review a Submittal more than twice because of failure of the Submittal to meet the requirements of the Contract Documents, Engineer will record Engineer's expenses for performing additional reviews.
   2. Owner will compensate Engineer for these additional services and deduct the amount paid from payments to Contractor.

END OF SECTION 01 33 00

SECTION 01 41 00 – REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes provisions for requirements and fees of regulatory agencies.

B. Related Sections include permits and licenses indicated in other Sections.

C. The General Conditions requires that Contractor obtain and pay for all construction permits. This Section includes provisions for specific permits but does not include all permits.

1.3 PERMITS

A. Soil Erosion and Sedimentation Control:
   1. Contractor:
      a. Obtain soil erosion and sedimentation control permit from Eaton County.
      b. Pay fees and charges.
      c. Comply with requirements and conditions of the permit.

1.4 OTHER PERMITS

A. Owner has applied for and will obtain the following permits:
   1. Water System Construction (Act 399, P.A. 1976):
      a. Agency: EGLE.
      b. Not yet obtained.
   2. Right-Of-Way Construction Permit:
      a. Agency: MDOT.
      b. MDOT Permit has been obtained for construction of the water main and placement of temporary signs within the MDOT controlled ROW (M-43 and M-100).
      c. Refer to Division 01 Section “Traffic Control” for additional permit requirements and permit attachments.

B. Permit Compliances:
   1. Ensure that permit has been issued prior to beginning the Work.
   2. Comply with requirements of permits.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION 01 41 00

SECTION 01 42 00 – REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes provisions for references throughout the Contract Documents.

1.3 DEFINITIONS

A. Abbreviations:
1. AASHTO - American Association of State Highway and Transportation Officials, 444 North Capitol Street, N.W., Suite 249, Washington, DC 20001.
2. ACI - American Concrete Institute, 38800 Country Club Dr., Farmington Hills, MI 48331.
3. AISC - American Institute of Steel Construction, Inc., One East Wacker Dr., Suite 700, Chicago, IL 60601-1802.
4. AITC - American Institute of Timber Construction, 7012 S. Revere Pkwy., Suite 140, Centennial, CO 80112.
5. ANSI - American National Standards Institute, 25 West 43rd St., 4th Floor, New York, NY 10036.
6. APA - American Plywood Association, 7011 S. 19th Street, Tacoma, WA 98466-5333.
7. ASTM - American Society for Testing and Materials, 100 Barr Harbor Dr., West Conshohocken, PA 19428-2959.
8. AWS - American Welding Society, Inc., 550 N.W. LeJeune Road, Miami, FL 33126.
9. AWWA - American Water Works Association, 6666 West Quincy Avenue, Denver, CO 80235.
10. CPA – Composite Panel Association, 19465 Deerfield Avenue, Suite 306, Leesburg, VA 20176.
11. CRSI - Concrete Reinforcing Steel Institute, 933 Plum Grove Road, Schaumburg, IL 60173-4758.
12. EGLE - Michigan Department of Environment, Great Lakes and Energy, 525 West Allegan Street, P.O. Box 30473, Lansing, MI 48909-7973.
13. MDNR - Michigan Department of Natural Resources, 530 West Allegan Street, P.O. Box 30028, Lansing, MI 48909.
14. MDOT - Michigan Department of Transportation, 425 West Ottawa Street, P.O. Box 30050, Lansing, MI 48909.
15. MDCH - Michigan Department of Community Health, 201 Townsend Street, Lansing, MI 48913.
16. MIOSHA - Michigan Department of Licensing and Regulatory Affairs, Michigan Occupational and Health Administration, State Secondary Complex, 7150 Harris Drive, P.O. Box 30643, Lansing, MI 48909-8143.
17. NCMA - National Concrete Masonry Association, 13750 Sunrise Valley Drive, Herndon, VA 20171-4662.
18. NEC - National Electrical Code (see NFPA 70).
19. NEMA - National Electrical Manufacturers' Association, 1300 N. 17th Street N.W., Suite 1752, Rosslyn, VA 22209.
20. NFPA - National Fire Protection Association, One Batterymarch Park, Quincy, MA 02169-7471.
21. NSF – National Sanitation Foundation International; 789 N. Dixboro Road, Ann Arbor, MI 48105.
22. PCI - Precast Concrete Institute, 200 West Adams, Suite 2100, Chicago, IL 60606.
23. SDI - Steel Deck Institute, P.O. Box 25, Fox River Grove, IL 60021.
24. SJI - Steel Joist Institute, 234 West Cheves Street, Florence, SC 29501.
25. UL - Underwriters' Laboratories, Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.

1.4 REFERENCES

A. The provisions of the Contract Documents shall govern over any conflicting provisions of the referenced documents.

B. The provisions of laws and regulations shall govern over any conflicting provisions of the referenced documents.

C. Comply with the referenced document that is in effect as of the Bid date, except when a specific date is specified.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION 01 42 00

SECTION 01 45 35 – TESTING SERVICES FOR BURIED UTILITIES, ROADWAYS, AND SITE PROJECTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes testing services as follows:
   1. Testing services which will be paid for from a cash allowance as specified in Division 01 Section "Cash Allowances" and performed by an independent testing agency selected by the Engineer or the
      a. Fill material from onsite and offsite.
      b. Fine and coarse aggregate certification tests.
      c. Bedding material certification tests.
      d. Bituminous pavement materials.
      e. Laboratory soil proctor tests.
      f. Soil compaction tests.
      g. Verification of soil bearing capacity.
      h. Base and subbase compaction tests.
      i. Pavement compaction tests.
      j. Collecting and transporting soil samples to the independent testing agency's laboratory.
      k. Laboratory soil proctor tests.
      l. Concrete slump and air entrainment tests.
      m. Concrete cylinder compressive strength tests.
      n. Travel expense of the independent testing agency.
      o. Making concrete cylinders.
      p. Transporting cylinders to testing agency's laboratory and performing tests.
   2. Testing services and certifications which not included under the cash allowance, should be included in the Contractor's base Bid
      a. Pipe leakage and pressure tests.
      b. Pipe material tests.
      c. Testing performed for the Contractor's convenience.
   3. Owner Paid Items:
      a. The Owner may elect to inspect or test or to employ either the Engineer or an independent testing agency to test materials on the Project other than those specified herein.
      b. The cost of this testing will be paid for by the Owner.

B. Testing services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for verification of compliance with Contract Document requirements.

1.3 REFERENCES

A. Except as herein specified or as indicated on the Drawings, the work of this Section shall comply with the following:
   1. AASHTO:
      a. Provisional Standard - TP 23 Standard Test Method for Water Content of Freshly Mixed Concrete Using Microwave Oven Drying.
   2. ASTM Specifications, Tests and Test Methods:
      a. C31 - Making and Curing Concrete Test Specimens in the Field.
      b. C33 - Specification for Concrete Aggregates Including Appendix XI.
      c. C39 - Test for Compressive Strength of Cylindrical Concrete Specimens.
      d. C42 - Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
      e. C138 - Test for Unit Weight, Yield and Air Content of Concrete.
      f. C143 - Test for Slump of Portland Cement Concrete.
      g. C172 - Sampling Fresh Concrete.
      h. C173 - Test for Air Content of Freshly Mixed Concrete by the Volumetric Method.
      i. C192 - Making and Curing Concrete Test Specimens in the Laboratory.

j. C227 - Standard Test Method for Potential Alkali Reactivity of Cement-Aggregate Combinations (Mortar-Bar Method).
k. C231 - Test for Air Content of Freshly Mixed Concrete by the Pressure Method.
l. C289 - Standard Test Method for Potential Alkali-Silica Reactivity of Aggregates (Chemical Method).
m. C295 - Standard Guide for Petrographic Examination of Aggregates for Concrete.
n. C567 - Unit Weight of Structural Lightweight Concrete.
o. C1077 - Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation.
p. D698 - Laboratory Compaction Characteristics of Soil Using Standard Effort.
q. D1188 - Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Paraffin-Coated Specimens.
r. D1556 - Density of Soil In Place by the Sand-Cone Method.
s. D1557 - Moisture-Density Relations of Soils and Soils Aggregate Mixture Using 10 Pound Rammer and 18-Inch Drop.
t. D1586 - Penetration Test and Split Barrel Sampling of Soils.
u. D1883 - CBR (California Bearing Ratio) of Laboratory Compacted Soils.
v. D2166 - Unconfined Compressive Strength of Cohesive Soil.
w. D2167 - Density of Unit Weight of Soil In Place by the Rubber Balloon Method.
x. D2922 - Density of Soil and Soil Aggregates by Nuclear Methods.
y. D2937 - Density of Soil in Place by Drive Cylinder Method.
z. D2950 - Test Methods for Density of Bituminous Concrete in Place by Nuclear Methods.
aa. D3666 - Minimum Requirements for Agencies Testing and Inspecting Bituminous Paving Materials.
bb. D3740 - Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as used in Engineering Design and Construction.

3. ACI - American Concrete Institute:
   a. 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete.
   b. 211.1R - Report on Alkali-Aggregate Reactivity.
   c. 301 - Specification for Structural Concrete for Buildings.
   d. 318 - Building Code Requirements for Reinforced Concrete.
4. MDOT Standards: Michigan Cone Test for Determination of Maximum Unit Weight of Granular Soils.

1.4 TEST REQUIREMENTS

A. In accordance with:
   1. Laws and Regulations.
   2. Sections of these Specifications.
   3. Reference procedures and requirements.
   4. Pertinent standards for testing.

B. Testing Agency Qualifications:
   1. Approved by authorities having jurisdiction.
   2. Agency meeting the requirements of ASTM C1077, D3666, and D3740.
   3. Agency whose primary business is materials and construction testing.
   4. Approved by the Engineer or the Owner.
   5. Objective, competent and independent from the Contractor performing the work to be inspected.
   6. Having adequate equipment, periodically calibrated as required, to perform the special inspections.
   7. Employing experienced personnel educated in conducting, supervising and evaluating special inspections similar in complexity to that required for the Project.

1.5 RETESTING COSTS

A. Retesting:
   1. When initial special inspections of items except soil compaction indicate noncompliance with the Contract Documents, subsequent special inspections occasioned by the noncompliance shall be performed by the same special inspection agency, and the costs thereof will not be reimbursed.
   2. Soil Compaction:
      a. The first retesting of soil compaction shall be paid for in accordance with the provisions of the Contract Documents.
      b. The second and subsequent retesting for soil compaction due to noncompliance with the Contract Documents shall be performed by the same special inspection agency, and the costs thereof will not be reimbursed.

1.6 REPORTS

A. Provide the Engineer's field representative and Contractor's superintendent with a draft copy of the daily report prior to leaving the Project Site each day on which testing is performed on the Site.

B. Provide typed copies of testing agency reports, inspections, and certifications within 5 business days to:
   1. The Engineer's Office: One copy.
   2. The Contractor's Office: One copy.

1.7 SCHEDULING TESTING

A. Coordinate and schedule the work of the independent testing agency.
   1. Notify the Engineer and the independent testing agency 48 hours prior to the expected time when testing services will be required.
   2. Provide access to the Work as necessary for the agency to properly perform its functions.

B. Establishing Schedule: By advance discussion with the Engineer and independent testing agency, determine the time required to perform tests and to issue findings.

C. Revising Schedule: When changes of construction schedule are necessary during construction, coordinate all such changes with the independent testing agency as required.

D. Adherence to Schedule: When the independent testing agency is ready to test according to the determined schedule, but is prevented from testing or taking specimens due to incompleteness of the Work, all extra costs for testing attributable to the delay will be paid by the Contractor.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.1 TESTING REQUIREMENTS

A. Fine and Coarse Aggregate and Bedding Material:
   1. Sieve test to ensure compliance with the materials specifications.
   2. Provide 1 test for each source of imported materials as directed by the Engineer.

B. Fill Material from Onsite and Offsite Sources: Sieve test to ensure compliance with the materials specifications.

C. Soil Compaction:
   1. Minimum Frequency of Testing:
      a. Utility Trenches: One test for every 200 linear feet of trench length at each lift.
      b. Utility Structures: One test under each manhole, vault or other structure.
      c. Curb and Gutter: One test for every 100 linear feet.

d. Pavement Subgrade, Base Grade:
   1) One test for every 2,500 square feet for road construction.
   2) One test at every driveway or curb cut location.
   3) One test for every 500 square feet for road intersections.

2. Predominately Granular Soils:
   a. Perform necessary laboratory and field testing required to verify compaction of fill, bedding, trench backfill and structure backfill in accordance with ASTM D1557 or Michigan Cone.
   b. Verify the compaction of the first 12 inches of the existing subgrade below structures, utility structures, paved areas, and areas to be filled in accordance with ASTM D1557 or Michigan Cone.
3. Predominately Cohesive Soils:
   a. Perform necessary laboratory and field testing required to verify compaction of fill trench backfill and structure backfill in accordance with ASTM D698.
   b. Verify the compaction of the first 12 inches of the existing subgrade below structures, utility structures, paved areas, and areas to be filled in accordance with ASTM D698.
4. Independent testing agency shall inform the Engineer and the Contractor's onsite supervisor immediately of onsite test results.
5. Place no additional fill in areas where compaction results do not meet Specification requirements.

D. Testing Bituminous Paving:
1. The testing agency shall provide quality control and testing services that will be monitored by the Engineer’s field representatives continuously during paving.
2. The testing agency shall take 1 mixture sample per day and 1 test per 1,000 tons of material placed.
   a. This sample shall be taken randomly from the back of the hauling unit.
   b. This sample shall be large enough to provide the Contractor, testing agency, and Engineer with an equal split of the sample.
   c. The testing agency shall test the samples for the following:
      1) 50 blow Marshall bulk specific gravity or a 50 gyration gyratory compactor bulk specific gravity (G_{mb}).
      2) Theoretical Maximum Density (TMD) (AASHTO T209) or maximum specific gravity of paving mixture (no air voids) (G_{mm}).
      3) % Asphalt binder.
      4) Aggregate gradation and % crushed aggregate.
   d. With the above information and the mix design aggregate effective specific gravity, calculate the following:
      1) Mixture air voids.
      2) Mixture voids in the mineral aggregate (VMA) using bulk specific gravity of aggregate (Gsb).
      3) % Asphalt binder.
3. The results of these tests shall be compared to the approved mix design and must be within the tolerances indicated below or all additional truck loads of non-compliant material shall be removed from the Site.
   a. The material supplier shall then make recommendations to the Engineer of how the mixture will be revised to meet the Specifications.
   b. The results of these tests and the split samples must be presented to the Engineer before mixture production begins the following day.
   c. If the Engineer wishes to test the split samples, they may use the supplier’s laboratory and equipment.
   d. The Engineer reserves the right to work with the supplier and modify the supplier’s mix design to ensure the product meets the Drawings and Specification requirements.
   e. This may include increasing asphalt content and adjusting aggregate gradations within the bituminous mixture composition specification.

Testing/Verification Tolerances			
Parameter	Single test	Average of 2 or more tests	Comments
Air Voids	±1.00%	-1.0%+0.5%	
VMA	±1.20%	±1.20%	
TMD (G_{mm})	±0.019	±0.015	
Asphalt Binder	±0.4%	±0.3%	>0.4% less than JMF may be subject to reduced payment
%Fines/% Asphalt	Max 1.6	Max 1.6	Result must be less than 1.6
#4 sieve	±5.0%	±3.0%	
#30 sieve	±4.0%	±3.0%	
#200 sieve	2.0%	±1.0%	
Crushed Particles	±10%	±10%	>10% less than JMF may be subject to reduced payment

4. The Contractor shall have the testing agency's density technician and a density gage available whenever paving is occurring. This technician and gage shall monitor placement and compaction of asphalt to verify the maximum density possible is being achieved.
5. Density gage readings shall be taken at core locations prior to coring.
6. The testing agency shall take 1 core on each 25,000 square feet of new parking lot.
    a. The percent compaction of these cores shall be calculated using the TMD of the approved mix design (JMF) unless otherwise directed and the results used for determining compliance with this Specification.
    b. The daily average in place density:
        1) Low/medium Volume Roads: 95.0% of the mixture's TMD or greater with a minimum density of 94% of TMD.
        2) Heavy Volume Roads: 94% of the mixtures TMD or greater with a minimum density of 93% TMD.
    c. Areas that are not compacted to the specified daily average will be evaluated by the Engineer and may either be removed or subject to a price reduction.
7. Thickness: In place compacted thickness tested in accordance with ASTM D3549.
8. Surface Smoothness:
    a. Test finished surface of each hot mix asphalt course for smoothness, using 10 foot straightedge applied parallel with and at right angles to centerline of paved area, or by measuring depths of bird baths immediately after a rain.
9. Workmanship:
    a. Finished Surfaces, Especially in High Visibility Areas: Smooth, free of cracks, raveling or spalling holes, rake or roller marks and depressions, or bird baths.
    b. Problem Areas Identified: Correct by removing, paving or reheating and re-rolling if possible.
10. Test Reports:
    a. Summarize the results of the bituminous paving using the "Report of Verification/Acceptance Testing & Core Density."
    b. Electronically submit this document to the Project team on a daily basis prior to the placement of any subsequent pavement.

E. Concrete Testing:
1. Point of sampling and the method of securing the Samples:
    a. Determined by the independent testing agency.
    b. In accordance with ASTM C172.
2. Slump Tests:
    a. Perform slump tests in accordance with ASTM C143.
    b. Perform 1 slump test on the Site for each truckload of concrete.
    c. At the Engineer's request, also perform slump tests at batch plant before adding water reducer.
    d. Perform more slump tests if deemed necessary by the Engineer.
3. Perform 1 air-entraining test in accordance with ASTM C231 or C173 for each truckload of concrete.
4. Test the concrete unit weight in accordance with ASTM C138 or C567, as applicable.
5. Test the air content and fresh concrete temperature of each set of concrete cylinders.

6. Concrete Cylinder Testing:
   a. In accordance with ASTM C31 and C39.
   b. Take concrete cylinder Sample set as follows:
      1) Once for each 150 cubic yards (or fraction thereof) of each class of concrete placed each day, nor less than.
      2) Once for each 2,500 square feet of sidewalk or paving surface area placed each day.
   c. Concrete Cylinder Sample Set: Consist of 4 standard 6-inch cylinders.
   d. Handle cylinders carefully.
   e. Onsite Storage:
      1) Handle cylinders carefully.
      2) 12 hours, minimum, 48 hours maximum.
      3) Store at a temperature range of 60 to 80 degrees F and in a moist environment.
      4) Shield from direct sunlight and radiant heat.
      5) Construct heated or water bath enclosures, as applicable, if conditions require.
      6) Cylinder samples taken to establish adequate strength for form removal earlier than 28 days shall be cured in locations that represent the conditions under which the structural concrete will be cured.
   f. Laboratory Curing: For duration of curing after onsite storage.
   g. Test 1 of the cylinders at 7 days and 2 cylinders at 28 days. Save 1 cylinder as a spare.
   h. Acceptance and evaluation of the concrete shall be based on ACI 301.

END OF SECTION 01 45 35

SECTION 01 50 00 – TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the furnishing and installation of construction facilities as follows:
   1. Storage areas.
   2. Temporary Utilities: Water
   3. Sanitary facilities.
   4. Enclosures such as tarpaulins, barricades and canopies.

1.3 STORAGE AREAS

A. Locations:
   1. Coordinate with Owner and Engineer for site availability of general areas available for storage.
   2. Specific storage locations within the general areas:
      a. Carefully coordinate with Owner.
      b. Subject to approval of Owner.

B. Protection and Restoration:
   1. Protect trees and shrubs in the storage areas.
   2. Replace grass and other vegetation disturbed or damaged in the storage areas.
   3. Take reasonable means to prevent spillage of fuel, oil, chemicals and similar materials.
   4. Clean up spills and, if necessary, remove soil and replace with uncontaminated soil so as to allow vegetation to be quickly reestablished.
   5. Provide secondary containment for storage of hazardous materials, as required by governing authorities or agencies.

C. Cleaning: Keep storage areas clean.

D. Storage: Maintain in accordance with Division 01 Section “Product Storage and Handling Requirements.”

PART 2 - PRODUCTS

2.1 MATERIALS

A. General:
   1. New or used.
   2. Adequate in capacity for the required usage.
   3. Provide safe conditions.
   4. Comply with requirements of applicable codes and standards.

2.2 UTILITIES

A. Temporary Utilities:
   1. Equipment Testing:
      a. Furnish, install, remove and pay for associated temporary equipment, piping, pumps, fuel, power distribution, and connections.
   2. Water:
      a. Owner will pay for water usage charges.
      b. Furnish, install, remove and pay for all temporary piping, water meters, equipment and connections.
      c. Obtain water by connection to Owner's existing water system.

2.3 SANITARY FACILITIES

A. Furnish and install required sanitary facilities, including temporary toilet buildings with sanitary toilets and hand washing facilities or hand sanitizing stations, for use of workers; comply with minimum requirements of the Health Department or other public agency having jurisdiction; maintain in a sanitary condition at all times.

2.4 OTHER TEMPORARY CONSTRUCTION FACILITIES

A. Furnish, install and maintain all other temporary construction facilities necessary for proper completion of the Work.

PART 3 - EXECUTION

3.1 GENERAL

A. Maintain and operate systems to ensure continuous service.

B. Modify and extend systems as Work progress requires.

3.2 TEMPORARY TRAFFIC CONTROLS

A. Traffic Control:
   1. Provide adequate signs and barricades; take all necessary precautions for the protection of the Work, and the safety of the general public.
   2. Signs and barricades shall conform to the Michigan Manual of Uniform Traffic Control Devices.
   3. All signs, barricades and other protective devices shall be installed and maintained in conformity with applicable statutory requirements and, where within highway rights-of-way, as required by the authority having jurisdiction thereover.
   4. No flashing/warning lights or flagmen shall be used.

B. Detours:
   1. Shall be approved by Owner and highway authority having jurisdiction prior to closing any road.
   2. Contractor shall secure above approvals and comply with all conditions thereof at Contractor's expense.

3.3 REMOVAL

A. Maintain all temporary facilities and controls as long as needed for the safe and proper completion of the Work. Remove all such temporary facilities and controls as rapidly as progress of the Work will permit.

END OF SECTION 01 50 00

SECTION 01 55 26 – TRAFFIC CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the major items listed below:
   1. Maintaining traffic and parking.
   2. Temporary facilities for:
      a. Maintaining emergency vehicle access.
      b. Maintaining pedestrian access.
      c. Detours.

1.3 REFERENCES

A. Except as herein specified or as indicated on the Drawings, the work of this Section shall comply with the following:
   1. MDOT:
      a. 2020 MDOT Standard Specifications for Construction.

      b. 2011 Michigan Manual of Uniform Traffic Control Devices, as amended.
      c. Current MDOT Maintaining Traffic Typicals.

1.4 DEFINITIONS

A. Abbreviation for Michigan Manual of Uniform Traffic Control Devices: MMUTCD.

B. Terms:
   1. Traffic: Includes all users of the roadway, motorized and non-motorized.
   2. Traffic Control Device: Includes, but is not limited to, signs, pavement markings, traffic signals, traffic channelizing devices, flagging devices, and other devices designed to provide orderly and predictable movement of traffic, and assist vehicle operators in vehicle guidance and navigation tasks.

1.5 SEQUENCING AND SCHEDULING

A. Coordination with Construction Sequencing and Schedule:
   1. This section is coordinated with sequencing and scheduling proposed in Division 01 Section “Summary of Work.”
   2. Adjustments to the proposed sequencing and scheduling may require changes to work described in this section, which must be approved by the Engineer and Owner. Such changes shall be at no additional cost to Owner.

1.6 SUBMITTALS

A. Drawings:
   1. Coordinate with alternative proposed sequencing and scheduling.
   2. Submit for:
      a. Alternative proposed detour routes.
      b. Alternative proposed closure details.
   3. Required Information:
      a. Dimensions.
      b. Locations of proposed traffic control devices.

1.7 MAINTENANCE

A. Extra Materials:
   1. General:
      a. Supplied by the Contractor at no expense to the Owner.
      b. Store on Site to replace stolen or damaged materials.
   2. Minimum Quantities of Extra Materials:
      a. Drums: 40 each.
      b. Type III Barricades: 8 each.

B. Maintenance Service:
   1. Inspect temporary traffic control devices daily during the course of the Work.
   2. Deficiencies in the location or condition of traffic control devices shall be corrected immediately.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All materials for temporary traffic control devices shall conform with the MDOT 2020 Standard Specifications for Construction and the MMUTCD, as amended.

2.2 TEMPORARY PAVEMENTS

A. Provide temporary pavements to maintain local and emergency access:
   1. Temporary Roads:
      a. Aggregate: 6 inches of MDOT 21AA, or Engineer Approved Equal.
   2. Temporary Sidewalks:
      a. Aggregate: 4 inches of MDOT 21AA, or Engineer Approved Equal.

PART 3 - EXECUTION

3.1 GENERAL

A. Take necessary precautions including, but not limited to, provision of necessary traffic control devices, implementation of closures, construction of temporary facilities, and maintenance of detours as necessary for the safety of the general public, efficient movement of traffic, and the protection of the Work.

B. Temporary traffic controls shall be installed and maintained in conformity with applicable statutory requirements and as required by the governing roadway authority.

3.2 MAINTAINING ACCESS

A. Maintain emergency traffic at all times during the Work:

B. Pedestrian Access:
   1. Conduct Work to minimize obstruction to pedestrian traffic.
   2. Barricade and fence disturbed or obstructed pedestrian facilities
   3. Restore disturbed pedestrian facilities at the earliest possible date using temporary pavement as necessary.

C. Driveways:
   1. Conduct Work to minimize the duration of closures.
   2. Provide written notice to property owners and occupants 24 hours prior to closing residential access.
   3. Provide written notice to property owners and occupants 48 hours prior to closing commercial access.
   4. Restore access using temporary pavement as indicated on the Drawings and as required by the Engineer.

3.3 DETOURS AND CLOSURES

A. Closures shall be in accordance with the MMUTCD, as specified herein, and as indicated on the Drawings:
   1. Detours maps and details are included on the Drawings.

B. Notification:
   1. Provide the Engineer and Owner a minimum of 48 hours' notice and receive approval before implementing a lane closure or detour.
   2. The Owner will notify local emergency services.

C. Detours and Closures:
   1. Stage 1 – Franklin Street Closure and Detour:
      a. Implement detour route indicated in the Drawings.
      b. Implement MDOT M0040a (Advance Signing) Typical on both bounds of M-100 (Jefferson Street) while work is active in the M-100 ROW.
   2. Stage 2 – Degroff Street Closure and Detour:
      a. Implement detour route indicated in the Drawings.
      b. Implement MDOT M0040a (Advance Signing) Typical on both bounds of M-43 while work is active in the M-43 ROW.

3.4 PROTECTION

A. Existing Traffic Control Devices:
   1. Protect all existing traffic control devices in the work area except as indicated on the Drawings:
      a. Promptly replace damaged traffic control devices.
      b. The Owner shall replace damaged traffic control devices and the cost will be deducted from the payments made to the Contractor.
   2. Do not remove, relocate, obstruct, or otherwise interfere with regulatory signs, including, but not limited to, stop signs, yield signs, and speed limit signs.
   3. Maintain street name signs within the construction area for the duration of the project.

B. Existing Traffic Control Device Removal:
   1. Existing traffic control devices to be removed shall remain the property of the Owner.
   2. Carefully remove traffic control devices to prevent damage.
   3. Stockpile at a location on Site to be determined by the Owner.
   4. Should the Owner decide not to retain ownership of the removed traffic control devices, dispose of the devices immediately.

3.5 PERMITS

A. MDOT Permit for construction within the M-43 and M-100 Right-of-Way has been obtained by the Owner.
   1. Contractor is required to provide 14 days advance Notice to Engineer and Owner prior to any work occurring within the M-43 and M-100 ROW including the erection of temporary signs.
   2. All work within the MDOT ROW must comply with the conditions of the approved permit and the issued drawings.
   3. MDOT Permit conditions are included as Exhibit A.

END OF SECTION 01 55 26

Michigan Department
Of Transportation
2205C (03/10)

SPECIAL CONDITIONS FOR UNDERGROUND CONSTRUCTION

The following special permit specifications shall apply when the permittee is excavating or performing any underground activity within trunkline right of way and discovers existing contaminated soil and/or an abandoned underground storage tank:

1. In the event the permittee encounters environmental contamination and/or an underground storage tank in the right of way, the Michigan Department of Transportation (MDOT) shall be immediately notified. All Michigan Department of Natural Resources and Environment (MDNRE) and Federal Environmental Protection Agency (EPA) environmental requirements shall be complied with by the permittee. Unless the Department agrees in writing the following steps are to be taken:

    a. The contaminated material that has been removed shall be temporarily stockpiled per MDNRE requirements. If stockpiled on the right of way, the site shall not interfere with MDOT operations or create a traffic safety problem. Also, the contaminated material shall be placed on plastic sheeting or tarp having a minimum thickness of 6 mils or in trucks, roll off boxes, or other containers, such that no liquid may escape from the containment. At the end of each work day, the contaminated material shall be covered securely with plastic sheeting of 6 mil thickness or greater.

    b. Upon completion of any testing deemed necessary by the Department or the MDNRE, the material shall be disposed of in an approved waste disposal site unless otherwise directed by the MDNRE.

    c. In no case shall the contaminated material be stockpiled for longer than 45 days prior to disposal.

2. The permittee shall cooperate with MDOT personnel and pertinent regulatory agencies in resolving the contamination problem as required by law.

    a. The manner in which the permittee manages and secures the site shall not interfere with the MDOT's interests.

    b. The permittee shall not excavate as part of any site management operation within the one-on-one slope from the edge of shoulder without the permission of MDOT.

3. MDOT shall not indemnify or compensate the permittee for any costs or damages of any kind that the permittee incurs as the result of contamination encountered within the right of way. It is understood that the possibility of encountering contamination and the damages which might be incurred by the permittee because of the contamination are business risks the permittee assumes in choosing to locate and maintain facilities within the Right-of-Way.

    The permittee is responsible for any costs that it incurs to secure the contaminated site in such a manner as to meet the requirements of the MDNRE and/or EPA and the requirements of MDOT.

4. The permittee, upon approval of MDOT, may continue to place its facility through the contaminated area providing remedial actions that meet the approval of MDOT and other enforcement agencies involved are followed.

    a. All additional costs the permittee incurs, as a result of continuing to place its facilities within the contaminated area, are the responsibility of the permittee.

    b. All contaminated material must be removed and properly disposed of as directed by MDOT and/or the MDNRE. All backfill material must be clean material, unless otherwise directed by the MDNRE. Excavation must be backfilled in a manner to prevent the creation of a pathway for migration of contamination off site.

5. The permittee is solely responsible to develop an alternate route for its facility in the event approval cannot be given to continue to place the facility within the contaminated area of the Right-of-Way. The permittee shall restore the original site as directed by MDOT.

SPECIAL CONDITIONS FOR HORIZONTAL DIRECTIONAL DRILLING (HDD)
November, 2007

1 Materials

1.1 Pipe

Approved materials for HDD include: medium-density polyethylene (MDPE), high-density polyethylene (HDPE), steel, fusible PVC, restrained joint PVC, and ductile iron pipe. Alternate materials will require prior approval.

MDPE and HDPE pipes shall conform to the current ASTM D1248, ASTM D2513, ASTM D3350, and ASTM F714. Steel pipe shall conform to the current ASTM A 53-97 and ASTM 139-96. Ductile iron pipe shall conform to the current ASTM 716-95 and ASTM 746-95. PVC pipe shall conform to the current ASTM F1962-99 and ASTM D2321-00.

1.2 Allowable forces

The pulling force shall not exceed the pipe manufactures recommendation. When using MDPE, HDPE, or fusible PVC pipe an extra six foot section of the pipe shall be pulled out of the borehole to check for any sign of stress or damage.

1.3 Pipe Characteristics

(a) MDPE and HDPE pipe shall have an SDR value of 11 or less.
(b) Pipe shall be without any significant dimensional or surface deformities. All pipes shall be free of visible cracks, holes, foreign material, foreign inclusions, blisters, or other deleterious or injurious faults or defects. Any section of the pipe with a gash, blister, abrasion, nick, scar, or other deleterious fault greater in depth than ten percent (10%) of the wall thickness, shall not be used.

1.4 Protective Coatings (Steel Pipe)

A coating to provide a corrosion barrier as well as an abrasion barrier is required. The coating shall be bonded well to the pipe and have a hard smooth surface to resist soil stresses and reduce friction. A mill-applied fusion bonded epoxy coating is required for steel pipes.

2 Construction

2.1 Minimum Allowable Depths

The minimum allowable installation depth of cover of a HDD installed pipe under the road and shoulder surface is correlated to the pipe diameter. Table 2 summarizes the minimum allowable depths:

Table 2 -- Minimum Allowable Depth

Pipe Diameters (inches)	Depth of Cover (feet)
6 or less	6
7 - 12	8
13- 24	10
24 and greater	12

In locations where the road surface is superelevated, the minimum depth of the bore shall be measured from the lowest side of the pavement surface. In addition, a minimum 3 foot depth shall be maintained in all other features including ditch bottoms.

2.3 Method

(a) The ends of each section of MDPE and HDPE pipe shall be inspected and cleaned as necessary to be free of debris immediately prior to joining the pipes by means of thermal butt-fusion. The Polyethylene pipe shall be of the same type, grade, and class of the polyethylene compound used in the process.

(b) The handling of the joined pipeline shall be in such a manner that the pipe is not damaged by dragging it over sharp or jagged objects. Sections of the pipes with cuts and gouges exceeding 10 percent of the pipe wall thickness or kinked sections shall be removed and the ends rejoined.

(c) Pipe rollers, skates or other protective devices shall be used to prevent damage to the pipe, eliminate ground drag, reduce pulling force, and reduce the stress on the pipe and joints.

(d) Sufficient space shall be allocated to fabricate and layout the product pipeline into one continuous pipe length, thus enabling the pull back to be conducted during a single operation. If space considerations are discovered that make this impossible, the permit applicant shall obtain specific alternative instructions from the MDOT Engineer/Inspector.

(e) The required piping shall be assembled in a manner that does not obstruct adjacent roadways or public activities.

(f) The drill path alignment shall be as straight as possible to minimize the frictional resistance during pullback and maximize the length of the pipe that can be installed during a single pull.

(g) The minimum radius of curvature of HDD path should be 1,200 times the nominal diameter of the pipe to be installed.

(h) For large diameters (greater than 20 in), an intermediate pre-reaming is required before pulling the utility into place.

(i) The drilling fluid in the annular region outside of the pipe shall not be removed after installation, and remain in place to provide support for the pipe and neighboring soil.

2.4 Drilling Site

(a) Location - A minimum distance, from the edge of the paved shoulder or curb, to the face of any access pit, equipment, and supplies, shall be 35 feet along freeways and limited access roadways and 25 feet along free access roadways. Any deviation from these distances shall require prior approval from the MDOT Engineer/Inspector.

(b) Protection-Fencing barriers shall be installed adjacent to equipment and supplies with suitable fencing and plastic drums to prohibit pedestrian access to the work site. Equipment shall not be used as fencing to protect access pits.

2.5 Overcut Allowance

The overcut diameter shall not exceed the outside diameter (OD) of the pipe by more than 1.5 times to ensure excessive voids are not created resulting in post installation settlement.

2.6 Watertight Joints

Water tight pipe joints are required to ensure the integrity of the roadbed. Pipe shall be constructed to prevent water leakage or earth infiltration throughout its entire length.

2.7 Drilling Fluids

(a) Drilling fluid shall be used during drilling and back reaming operations.
(b) Excess drilling fluids shall be contained within a lined pit or containment pond, or trailer-mounted portable tank, until removed from the site.
(c) All drilling fluids shall not enter the streets, manholes, sanitary and storm sewers, and other drainage systems, including streams and rivers.

2.8 Pipe Locating and Tracking-

The following requirements may be waived depending on size, bores and/or conditions:

(a) During construction, continuous monitoring and plotting of pilot drill progress shall be undertaken to ensure compliance with the proposed installation alignment. The contractor shall plot the actual horizontal and vertical alignment of the pilot bore at each edge of pavement and at intervals not exceeding 20 feet. This “as built” plan and profile shall be updated as the pilot bore is advanced.
(b) The contractor shall at all times provide and maintain instrumentation that will accurately locate the pilot hole and measure drilling fluid quantity. The contractor shall grant the Engineer/ Inspector access to all data and readout pertaining to the position of the bore head, the fluid pressures, and flows.
(c) Trace wire is required for all non metallic pipe installation for post construction location purposes.

2.9 Settlement/Heaving Monitoring

(a) This method shall be performed in a manner that will minimize the movement of the ground in front of, above, and surrounding the boring operation; and will minimize subsidence of the surface above and in the vicinity of the boring. The ground shall be supported in a manner to prevent loss of ground and keep the perimeter and face of the boring stable at all times, including during shutdown periods.
(b) Potential heave or settlement shall be monitored at each shoulder point, each edge of pavement, the edge of each lane (or centerline for two lane roads), and otherwise at 50 foot intervals along the pipe centerline.
(c) For pipe sizes larger than 3 inches a survey shall be performed one day prior to initiating this operation at each required monitoring location. A similar survey shall then be performed at each location, on a daily basis, until the permitted activity has been completed. All survey readings shall be recorded to the nearest one-hundredth (0.01) of a foot. Digital photographs of the pavement conditions shall also be taken prior and after the pipe installation.
(d) All operations shall stop immediately whenever monitored points indicate a vertical change in elevation of 1/2 inch or more, or any surface disruption is observed. The Contractor shall then immediately report the amount of settlement to the MDOT Engineer/ Inspector.

2.11 Failure

(a) Should anything prevent completion of this operation, the remainder of the pipe shall be constructed and/or abandoned by methods approved by the MDOT Engineer/Inspector.
(b) Abandonment of any component of the installation shall only be allowed as approved by the MDOT Engineer/Inspector.

3.12 Contamination

When an area of contaminated ground is encountered, all operations shall stop immediately, and shall not proceed until approved by the MDOT Engineer/Inspector. Any slurry shall be tested for contamination and disposed of in a manner, which meets Local, State and/or Federal requirements.

3.13 Bulkhead

Pipe ends shall be temporarily sealed with a cap until the connection is made permanent, to prevent water or earth infiltration.

3.14 Work Site Restoration

(a) Access pits and excavations shall be backfilled with suitable material, and in a method approved by the MDOT Engineer/Inspector.
(b) The disturbed grass-surface area shall be top soiled, seeded, fertilized, mulched, and anchored according the current MDOT Standard Specifications for construction, sections 816 and 917.
(c) Upon completion of the work, the contractor shall remove and properly dispose of all excess materials and equipment from the work site.

GENERAL CONDITIONS

This permit is issued subject to the following General Conditions:

1. This permit grants to the permittee only those rights specifically stated and no other. Maintenance work within the trunkline right of way may require a separate permit unless authorized within the scope of the annual permit.

2. Issuance of this permit does not relieve permittee from meeting any and all requirements of law, or of other public bodies or agencies. The permittee shall be responsible for securing including but not limited to any other permissions including or required by law including but not limited to cities, villages, townships, corporations, or individuals for the activities hereby permitted.

3. The permittee agrees as a General Condition of this permit to:

   a. Have in the permittee's or the permittee's representative's possession on the job site at all times the approved permit, advanced notice and any necessary plans or sketches.

   b. Submit Advance Notice through the online Construction Permit System (CPS) at least five (5) working days prior to commencement of any operations covered by this permit. No work shall start until an approved Advance Notice is e-mailed to the permittee.

   c. Perform no work except emergency work, unless authorized by the Department (Michigan Department of Transportation [MDOT]), on Saturdays, Sundays, or from 3:00 p.m. on the day proceeding until the normal starting time the day after the following holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day and Christmas Day.

   d. Perform no work except emergency work during periods of inclement weather when reduced visibility or slippery conditions impair trunkline traffic.

   e. Provide and maintain all necessary precautions to prevent injury or damage to persons and property from operations covered by this permit.

   f. Furnish, install and maintain all necessary traffic controls and protection during permittee's operations in accordance with the Michigan Manual of Uniform Traffic Control Devices and any supplemental specifications set forth herein.

   g. Once work is initiated that includes any lane restrictions, that work must be continued daily until completed. A lack of work activity for more than 3 days will require the removal of lane closures at no expense to the Department.

   h. Notify the Department of completion of work authorized by this permit through CPS, so that final inspection may be made and surety deposit released (where applicable). Surety deposit will not be released until the work authorized by the permit has been completed and inspected, and all inspection charges billable to the permittee are paid.

4. Nothing in this permit shall be construed to grant any rights whatsoever to any public utilities, except as to the consent herein specifically given, nor to impair any existing rights granted in accordance with the constitution or laws of this state.

5. Any operations in the trunkline right of way not covered by permit and the appropriate Department specifications are in violation of the jurisdictional authority of the Department, with respect to the control of the trunkline right of way, unless approved by the Department. Any change or alteration in the permit activities requires prior approval of the Department and may require a new permit.

6. Performance of the requirements of this permit is the responsibility of the permittee. The permittee shall complete all operations for which this permit is issued in accordance with the General Conditions and conditions of this permit, by the specified completion date. The permittee shall meet all requirements of the current Department Standard Specifications for Construction, and the Supplemental Specifications set forth on/or incorporated as a part of this permit.

7. The construction, operation and maintenance of the facility covered by this permit shall be performed without cost to the Department unless specified herein. The permittee shall be responsible for the cost of restoration of the state trunkline and right of way determined by the Department to be damaged as a result of the activities of the permittee.

8. Facilities allowed on state trunkline right of way shall be placed and maintained in a manner which will not impair the state trunkline or interfere with the reasonable safe and free flow of traffic. Failure of the permittee to maintain the facilities located within the State trunkline right of way so as not to interfere with the operation, maintenance or use of the state trunkline by the traveling public may result in revocation of the permit.

9. The permittee is solely and fully responsible for all activities undertaken pursuant to the permit. Any and all actions by the Department and those governmental bodies performing permit activities for the Department pursuant to a maintenance contract, including but not limited to any approved reviews and inspections of any nature, permit issuing, and final acceptance or rejection of the work or activity authorized by the permit shall not be construed as a warranty or assumption of liability on the part of the Department or those governmental bodies. It is expressly understood and agreed that any such actions are for the sole and exclusive purposes of the Department and the governmental bodies acting in a governmental capacity. Any such actions by the Department and governmental bodies will not relieve the permittee of its obligations hereunder, nor are such actions by the Department and the governmental bodies to be construed as a warranty as to the propriety of the permittee's performance.

   Note: The following General Condition does not apply to municipalities with executed resolutions on file with MDOT.

   The permittee shall indemnify, defend, and save harmless the State of Michigan, Michigan Transportation Commission, the Department and all officers, agents and employees thereof, and those governmental bodies performing permit activities for the Department and all officers, agents and employees thereof, pursuant to a maintenance contract, against any and all claims for damages arising from operations covered by this permit except claims resulting from the sole negligence or willful acts or omissions of said indemnities, its agent, or employees. In addition, permittee upon request shall furnish proof of insurance coverage for the term of this permit in an amount pre-specified.

10. The permittee or representative must ensure that all insurance policies and binders include an endorsement by which the insurer

agrees to notify the Department in writing at least 30 days before there is a cancellation or material change in coverage. The permittee or representative must stop operations if any insurance is cancelled or reduced and must not resume operations until new insurance is in force. The State of Michigan, Michigan Transportation Commission, Department of Transportation, and governmental bodies performing permit activities under a maintenance contract, and all officers, agents, and employees of all the above, for claims arising out of, under, or by reason of operations covered by the permits issued to the permittee.

11. This permit is not assignable and not transferable unless specifically agreed to by the Department.

12. The permittee, upon request of the Department, shall immediately remove, cease operations, and surrender this permit, or alter or relocate, at the permittee's own expense, the facility for which this permit is granted. Upon failure to do so, the Department may take any necessary action to protect the trunkline interest and the permittee shall reimburse the Department for its costs in doing same. The permittee expressly waives any right to claim damages or compensation in the event this permit is revoked.

13. The permittee shall, upon request by the Department, furnish a performance surety deposit in the form of a bond, cash, certified check, or (when authorized by the Department) an irrevocable letter of credit in such amount as deemed necessary by the Department to guarantee restoration of the trunkline highway or performance under the General Conditions and conditions of the permit.

14. The permittee hereby acknowledges and agrees that the Department has the right to demand completion by the permittee, or the performance surety, or to complete any uncompleted activity authorized by this permit which adversely affects the operation and/or maintenance of the state trunkline highway, or which is not completed by the expiration date of the permit, including:

    a. Completion of construction of driveway and/or approach (not authorized by annual permit).
    b. Removal of materials.
    c. Restoration of the trunkline facilities and right of way as necessary for the reasonably safe and efficient operations of the trunkline highway.

    The permittee further agrees to immediately reimburse the Department in full for all such costs incurred by the Department upon receipt of billing, and that upon failure to pay, the Department may affect payment with the performance surety deposit. Should the surety deposit be insufficient to cover expenses incurred by the Department, the permittee shall pay such deficiency upon billing by the Department. If the surety deposit exceeds the expense incurred by the Department, any excess will be returned or released to the depositor upon completion of the work to the satisfaction of the Department.

15. The Department reserves the right during the time any or all of the work is being performed to assign an inspector to protect the trunkline interest, and to charge the permittee all such costs incurred. In addition, the permittee may be billed any engineering and review fees incurred by the Department or its agent in connection with the work covered by this permit.

16. Emergency Operations: In time of disaster or emergency, or when utility lines or facilities are so damaged as to constitute a danger to life and/or property of the public, access to the same may be had by the most expeditious route. Work is to be completed in a manner which will provide the traveling public with maximum possible safety and minimize traffic distribution. Notice of such situations shall be given to the nearest police authority and the department as soon as can reasonably be done under the circumstances. During normal Department work hours, the facility owner shall advise the Department of any operations within right of way which affect traffic operations or the highway structure or facilities prior to performance of the work. After normal Department work hours, the permittee, at the beginning of the first working day after the emergency operation, shall advise the Department of any operations which affect traffic operations or the highway structures and facilities. If determined necessary by the Department, the permittee shall secure an individual permit for such work after notification.

17. Upon the Department's request, as built drawings of work performed will be furnished to the Department within 30 days after completion of the work.

18. The permittee shall give notice to public utilities in accordance with Act 174 of 2013, as amended, and comply with all applicable requirements of this act. The permittee shall also comply with requirements of Act 451, P.A. of 1994, as amended.

19. The permittee acknowledges that the Department is without liability for the presence of the permittee's facility which is located within the trunkline right of way. Acceptance by the Department of work performed, and/or notice of termination of performance obligations for the surety and/or the permittee do not relieve the permittee of full responsibility for the permittee's work or for the presence of the permittee's facility in the trunkline right of way.

20. Where the Department has accepted an Indemnification Commitment in lieu of bond and/or insurance policies, such commitment is incorporated into this permit by reference.

21. It is illegal to discharge substances other than storm water into the Department's storm sewer system unless permission has been obtained in writing for other discharges.

22. The permittee shall be responsible for obtaining information on permitted environmental site closures within MDOT right of way. MDOT has implemented a program that allows environmental contamination to remain within the right of way by use of a permit. Issued permit information can be obtained from the Region/TSC in which the permit is issued. If the permittee will encounter a site area identified as a site closure permit area, the permittee shall follow instructions and conditions set forth in Supplemental Specifications #3 and specifications found in form 2205-C, "Special Conditions for Underground Construction".

23. Other than for normal daily vehicle and equipment usage requirements, the permittee shall not use or store unattended equipment, or the following types of hazardous materials on, over, under, or immediately adjacent to Department or Local Agency owned buildings, bridges and structures, unless expressly approved by the Department in writing;

    Explosive, flammable gas, non-flammable gas, inhalation hazard, oxygen, flammable liquids, fuel oil, combustible, gasoline, flammable solids, spontaneously combustible, dangerous-when-wet, oxidizer organic peroxide, toxic, poisonous, inhalation hazard, infectious, radioactive, corrosive, or any other potentially hazardous material.

    Furthermore, the permittee shall not allow hazardous or unreasonably objectionable smoke, fumes, vapor, or odors to emit from any permitted operation. No junk, garbage, refuse or unused construction materials shall be stored or accumulated within the MDOT Right-of-Way.

24. It is the responsibility of the utility owner to provide the depth and location of their facilities within MDOT ROW upon the department's request.

SUPPLEMENTAL SPECIFICATIONS

1. Construction and Maintenance of Facilities – To construct and maintain utility crossings of limited access highways, access for the utility's service vehicles may be from county roads, service roads, and openings authorized in limited access right of way fences. The construction of utilities across limited access highways should be for the purpose of serving a general area rather than providing individual services, unless extenuating circumstances necessitate such crossings.

   Equipment, vehicles or personnel will not operate within a distance of 30 feet from the edge of the pavement of roadways or ramps on limited access highways. At locations where utilities have been constructed in medians having a width greater than 80 feet or have otherwise been allowed to remain or to be constructed in limited access right of way, ingress and egress shall be by such routes as specified by the Department, which may also specify additional safety provisions.

2. Restoration- Restoration of the trunkline highway and right of way will be such that it will provide a condition equal to or better than the original condition, in accordance with Michigan Department of Transportation Standard Specifications.

3. Excavation and Disposal of Excavated Material – The permittee shall provide and place the necessary sheeting, shoring and bracing required to prevent caving, loss or settlement of foundation material supporting the pavement, or any other highway installation such as sewers, culverts, etc. The permittee shall assume the full responsibility for this protection and shall not proceed in these areas before approval of the methods by the Department.

   Construction equipment and excavating material shall not be stocked in such locations that it creates a traffic hazard or interferes with the flow of traffic; and on limited access highways, shall be a minimum of 30 feet from the traveled way. Sod and topsoil shall be stacked separately from other excavated material. The permittee shall dispose of all surplus and unsuitable material outside of the limits of the highway, unless the permit provides for disposal at approved locations within right of way. In the latter case, the material shall be leveled and trimmed in an approved manner.

   When the permittee is excavating within trunkline right of way and discovers existing contaminated soil and/or an abandoned underground storage tank, special permit specifications entitled "Special Conditions for Underground Construction" (Form 2205-C) shall apply.

4. Utility Cuts, Trenches and Pavement Replacement – Utility crossing by pavement cutting and removal are generally prohibited. If extenuating circumstances make tunneling, boring and jacking impractical pavement cutting may be used with approval of the Department. All utility cuts, trenching and pavement replacement shall comply with the requirements of the Standard Specifications and the Standard Plan "Utility Cuts, Trenches and Pavement Replacement". Unless otherwise specified, cuts in concrete residential and commercial drives shall be as above; except that the patch width shall be a minimum of 3 feet and the remaining slab from patch to existing joint shall be a minimum of 3 feet. Backfill shall be made with sand-gravel as specified in the Standard Specifications, unless otherwise directed. After the backfill has been placed and compacted by controlled density method, the pavement shall be replaced with new pavement of the original type and quality, unless at the season of the year when it is not feasible to replace pavement in kind. In this case, a temporary surface of bituminous material shall be placed with Department approval and later replaced with pavement of the original type at the applicant's expense. Other pavement types may be allowed with prior approval of the Department.

5. Crossing Roadbed by Tunneling or Boring and Jacking – All crossing of roadbed operations involving tunneling, boring and jacking shall comply with the Department's special provisions for such work.

6. Backfilling and Compacting Backfill – Unless otherwise specified, all trenches, holes and pits shall be filled with sound earth or with sand-gravel if so provided, placed in successive layers not more than 9 inches in depth, loose measure, and each layer shall be thoroughly compacted by tamping. All backfill compaction will be subject to check by the controlled density method.

7. Depth of Cover Method- Unless otherwise authorized, pipes shall be placed to a depth that will provide not less than 6 feet of cover between the top of the roadway surface and the pipe, 3 feet cover below the ditch line. All bores across MDOT highways that are 12" or larger will require a geotechnical report that complies with the General Conditions and conditions of the permit.

8. Trees:

   a. The permittee is responsible for obtaining permission from abutting owners when trimming or removing trees on easement right of way.
   b. Tree removal or trimming may be undertaken only after submission of an "Advance Notice" through CPS, a field review by the Region Resource Specialist and an approved copy of the advanced notice is e-mailed to the permittee.
   c. Limbs, logs, stumps and litter shall be disposed of in a manner acceptable to the Department.
   d. Tree roots shall be bored a distance of one foot for each one inch of trunk diameter for underground utility installations

9. Aerial Wire Crossings – Vertical clearance of wires, conductors and cables over state trunkline shall not be less than required by Section 232 of the National Electrical Safety Code, except in no case shall the under-clearance below any wire, conductor, or cable, under any temperature or loading condition, be less than eighteen feet (18').

SECTION 01 66 00 – PRODUCT STORAGE AND HANDLING REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes provisions for the storage and protection of Products.

1.3 STORAGE AND PROTECTION

A. Storage:
   1. Maintain ample way for foot traffic at all times, except as otherwise approved by Engineer.
   2. Repair or replace property damaged by reason of storing of material at no additional cost to Owner.
   3. Packaged Materials:
      a. Delivered in original, unopened containers.
      b. Stored until ready for use.
   4. Materials shall meet the requirements of these Specifications at the time that they are used in the Work.
   5. Store Products in accordance with Manufacturer's instructions.

B. Protection:
   1. Use all means necessary to protect the:
      a. Products of every Section before, during and after installation.
      b. Installed work and materials of all trades.
   2. All materials shall be delivered, stored and handled to prevent:
      a. The inclusion of foreign materials.
      b. Damage by water, breakage or other causes.
   3. Provide weathertight storage sheds with raised floors as may be required to adequately protect those materials and Products stored on the Site which may require protection from damage by the elements.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of Engineer and at no additional cost to Owner.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION 01 66 00

SECTION 01 71 36 – MONITORING OF EXISTING CONDITIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes monitoring of groundwater, building settlement, and cracks.

1.3 SYSTEM DESCRIPTION

A. Groundwater Monitoring: A system of wells enabling the level of existing groundwater at the wells to be measured and reported.

B. Settlement Monitoring: A series of markers installed at predetermined locations, which locations relative to a fixed point are measured and reported.

C. Crack Monitoring: Instrumentation permitting the widths of existing cracks to be measured and reported.

1.4 PERFORMANCE REQUIREMENTS

A. Contractor’s Responsibilities:
   1. Contractor will be held responsible for damage to structures or buildings due to contractual activities.
   2. Repair or replace damaged structures or buildings in a timely fashion and to the satisfaction of the property owner and Owner and at no cost to property owner or Owner.

B. Measuring and Reporting: By Contractor.

1.5 SEQUENCING AND SCHEDULING

A. Install monitoring systems and take initial readings prior to commencement of construction activities.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All materials and workmanship shall conform to the requirements of other Sections of the Specifications.
   1. Where no materials are specified in these specifications, use materials of an equivalent type, quality, and size to match those existing in other areas of the facility.
   2. If none exist, use materials and workmanship recognized as of the highest quality in the industry.
   3. Obtain Engineer's review of all such material and workmanship.

B. Settlement Markers: Stainless steel nails or stainless steel screw anchors.

C. Crack Monitors:
   1. Avongard Calibrated Crack Monitors; or approved equal.
   2. Capable of measuring crack displacement and rotation to 1 mm.
   3. May include use of steel pins or other appropriate devices driven or grouted into concrete.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Preconstruction Survey:
   1. Conducted by Contractor and witnessed by Engineer following award of Contract and before beginning construction.
   2. At Contractor's expense and documented by Contractor in the form of:
      a. Preconstruction audio-video documentation.
      b. Pictures.
      c. Field notes.
   3. Include an assessment of existing structural conditions and documentation of cracks as identified by Engineer and Contractor.
   4. Structures to be surveyed include, but are not limited to the following:
      a. M-43 ROW as identified on the drawings and in compliance with MDOT permit requirements.].
      b. M-100 ROW as identified on the drawings and in compliance with MDOT permit requirements.
      c. Other locations on nearby structures as identified during the preconstruction assessment.

3.2 INSTALLATION AND MONITORING

A. Settlement Monitoring:
   1. Monitor Points: Hammer or grout into existing concrete or masonry surfaces or marked points on other structures.
   2. For bidding purposes, make provisions for 25 settlement markers at locations to be identified by Engineer following the preconstruction survey to be conducted by Contractor.
   3. Monitor settlement markers as follows:
      a. Reading 2 days before construction start in the vicinity of marker.
      b. Readings every day during construction within 100 feet of marker.
      c. Reading 1 week after completion of construction .
      d. Comply with MDOT Permit requirements for all monitoring in the M-43 and M-100 ROW.
   4. Settlement readings shall utilize an optical or better level having an accuracy of 0.01-foot.
   5. If movement of existing facilities greater than 0.125-inch occurs, stop construction activities and notify Engineer and Owner. Immediately implement a corrective action plan to repair damages resulting from such movement and install measures to prevent further damage from subsequent activities.
   6. Costs related to protection of existing facilities, as outlined above, shall be at Contractor's expense.
   7. At end of construction, remove markers and repair surfaces to match existing.

B. Crack Monitoring:
   1. For bidding purposes, make provisions for 50 crack monitors at locations to be identified by Engineer following the preconstruction survey to be conducted by Contractor.
   2. Monitor crack monitors as follows:
      a. Daily for 1 week prior to beginning activities that may affect cracks.
      b. Daily during activities that may affect cracks.
      c. Daily for 1 week after completion of activities that may affect cracks.
   3. If the crack width changes by more than 50%, stop construction activities and notify Engineer and Owner. Immediately implement a corrective action plan to repair damages resulting from such movement and install measures to prevent further damage from subsequent activities.
   4. At end of construction, remove monitors and repair surfaces to match existing.

3.3 CLEANING

A. Clean materials installed under this Section in accordance with Division 01 Section "Cleaning and Waste Management."

END OF SECTION 01 71 36

SECTION 01 74 00 – CLEANING AND WASTE MANAGEMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specifications Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes provisions for maintaining structures and the Site in a standard of cleanliness.

B. Related Sections: In addition to standards described in this Section, comply with requirements for cleaning as described in various other Sections of these Specifications.

1.3 QUALITY ASSURANCE

A. Inspection:
   1. Daily and more often if necessary.
   2. Conduct inspections to verify that requirements of cleanliness are being met.

1.4 DELIVERY, STORAGE AND HANDLING

A. Hazards Control:
   1. Volatile Wastes:
      a. Store in covered metal containers.
      b. Remove from premises daily.
      c. Provide secondary containment for storage of hazardous materials, as required by governing authorities or agencies.
   2. Prevent accumulation of wastes which create hazardous conditions.
   3. Provide adequate ventilation during use of volatile or noxious substances.

1.5 PROJECT CONDITIONS

A. Cleaning and Disposal:
   1. Conduct operations to comply with local ordinances and anti-pollution laws.
   2. Not Allowed:
      a. Burning or burying of rubbish or waste materials on Site.
      b. Disposal of volatile wastes in storm or sanitary sewers: Volatile wastes include, but are not limited to, mineral spirits, oil or paint thinner.
      c. Disposal of wastes into streams or waterways.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Compatibility:
   1. Compatible with the surface being cleaned.
   2. Recommended by the Manufacturer of the material being cleaned.
   3. As reviewed by Engineer.

PART 3 - EXECUTION

3.1 PROGRESS CLEANING

A. General:
1. Store Materials:
a. In an orderly arrangement allowing maximum access.
b. To allow unimpeded drainage and traffic.
c. Provide for the required protection of materials.
2. Do not allow accumulation of scrap, debris, waste material and other items not required for construction of the Work.
.
a. Remove from Site at least each week and more often if necessary.
b. Provide adequate storage for materials awaiting removal.
3. Observe requirements for fire protection and protection of the environment.

B. Site:
1. Daily, and more often if necessary:
a. Inspect the Site.
b. Pick up scrap, debris and waste material; remove such items to the place designated for their storage.
2. Weekly, and more often if necessary:
a. Inspect arrangements of materials stored on Site.
b. Restack or otherwise service arrangements to meet the requirements of paragraph 3.1.A.1 above.
3. At all times maintain the Site in a neat and orderly condition which meets the approval of Engineer.
4. Paved Surfaces: Keep clean.
5. Dust Control:
a. Control dust on or near the Work by the application of water, or other approved means.
b. If Contractor fails to correct unsatisfactory conditions with 24 hours after due notification:
1) Owner may arrange for such work to be performed by other means.
2) Pay costs.

C. Buildings, Tanks, and Other Structures:
1. Weekly, and more often if necessary:
a. Inspect.
b. Pick up scrap, debris and waste material; remove such items to the place designated for their storage.
c. Sweep interior spaces clean. Clean shall be defined to be free from dust and other material capable of being removed by reasonable diligence using a hand-held broom.
2. Preparation for installation of succeeding material:
a. Clean the building, tank or other structure or pertinent portion thereof:
1) To the degree of cleanliness recommended by the Manufacturer of the succeeding material.
2) Using equipment and materials required to achieve the required cleanliness.
3. After installation of finish floor material:
a. Clean the finish floor daily at all times while work is being performed in the space in which finish materials have been installed.
1) Clean as used above shall be defined to be free from all foreign material which, in the opinion of Engineer, may be injurious to the finish floor material.
4. Schedule cleaning operations so that dust and other contaminants resulting from cleaning operations will not fall on wet, recently painted surfaces.

3.2 FINAL CLEANING

A. Definitions for Clean: The level of cleanliness generally provided by commercial building maintenance subcontractors using commercial quality building maintenance equipment and materials.

B. Prior to Completion of the Work:
1. Remove from the Site all tools, surplus materials, equipment, scrap, debris and waste.
2. Conduct final progress cleaning as described in Article 3.1 above.

C. Site:
   1. Unless otherwise specifically directed by Engineer:
      a. Hose down paved areas on Site and public sidewalks directly adjacent to the Site.
      b. Rake clean other surfaces of the grounds.
   2. Remove resultant debris.

D. Buildings, Tanks and Other Structures:
   1. Exterior:
      a. Visually inspect exterior surfaces.
      b. Remove traces of soil, waste material, smudges and other foreign matter.
      c. Remove traces of splashed materials from adjacent surfaces.
      d. If necessary to achieve a uniform degree of exterior cleanliness, hose down the exterior surface.
      e. In the event of stubborn stains not removable with water, Engineer may require light sandblasting or other cleaning at no additional cost to Owner.
   2. Interior:
      a. Visually inspect interior surfaces.
      b. Remove traces of soil, waste material, smudges and other foreign matter.
      c. Remove traces of splashed materials from adjacent surfaces.
      d. Remove paint droppings, spots, stains and dirt from finished surfaces using only the specified cleaning materials and equipment.
   3. Glass: Clean glass inside and outside.
   4. Polished Surfaces: To surfaces requiring the routine application of buffed polish, apply the specified polish as recommended by the Manufacturer of the material being polished.

E. Timing: Schedule final cleaning as approved by Engineer to enable Owner to accept a completely clean Project.

3.3 OWNER OCCUPANCY PRIOR TO SUBSTANTIAL COMPLETION AND ACCEPTANCE

A. If Owner occupies the Work, or a portion of the Work, prior to Substantial Completion and acceptance, then the responsibilities for interim and final cleaning shall be determined by Engineer in accordance with the Contract Documents.

END OF SECTION 01 74 00

SECTION 01 77 00 – CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the instructions for and the responsibilities of each party in contract closeout.

B. Related Section includes Certificate of Substantial Completion.

1.3 SUBSTANTIAL COMPLETION

A. Contractor: When Contractor considers that the Work or any portion of the Work is ready for its intended use, Contractor shall submit:
   1. Written certification to Engineer and Owner that the Work, or designated portion of the Work, is substantially complete.
   2. A list of major items to be completed or corrected.
   3. Request that Engineer issue a certificate of Substantial Completion.

B. Engineer's Inspection: Engineer will make an inspection:
   1. Within 10 days after receipt of certification.
   2. Together with Owner and Contractor.

C. Engineer's Determination of Substantial Completion:
   1. Should Engineer consider the Work or designated portion of the Work substantially complete, the following steps shall be taken:
      a. Contractor shall prepare and submit to Engineer, a list of items to be completed or corrected as determined by the inspection.
      b. Engineer will prepare and deliver to Owner:
         1) A tentative certificate of Substantial Completion.
         2) A tentative list of items to be completed or corrected before final payment.
      c. Owner shall have 7 days after receipt of the tentative certificate during which to make written objection to Engineer as to any provisions of the certificate or attached list.
      d. Engineer will, within 14 days after delivery of tentative certificate to Owner, decide:
         1) Not Substantially Complete: Engineer will issue written notice to Contractor stating reasons.
         2) Substantially Complete: Engineer will issue definitive certificate of Substantial Completion and a revised list of items to be corrected or completed.
   2. Should Engineer consider that the Work or designated portion of the Work is not substantially complete, the following steps shall be taken:
      a. Engineer shall notify Contractor in writing stating Engineer's reasons.
      b. Contractor shall complete the Work and send a second written notice to Engineer certifying that the Project, or designated portion of the Project, is substantially complete.
      c. Engineer and Owner will reinspect the Work.

D. Division of Responsibilities:
   1. Engineer:
      a. At the time of delivery of tentative certificate of Substantial Completion.
      b. Deliver to Owner and Contractor a written recommendation as to division of responsibilities pending final payment with respect to:
         1) Security.
         2) Operation.
         3) Safety.
         4) Protection of the Work.
         5) Maintenance.

6) Heat.
7) Utilities.
8) Insurance.
9) Warranties.

2. Engineer's written recommendation on division of responsibilities shall be binding on Owner and Contractor until final payment unless Owner and Contractor agree otherwise in writing and so notify Engineer prior to Engineer's issuance of a definitive certificate of Substantial Completion.

1.4 FINAL INSPECTION

A. Contractor Certification: Prior to final inspection, Contractor shall submit written certification that:
1. The Contract Documents have been reviewed.
2. The Project has been inspected in compliance with the Contract Documents.
3. Work has been completed in accordance with the Contract Documents.
4. Equipment and systems have been tested in the presence of the Owner's representative and are operational.
5. The Project is complete and ready for final inspection.

B. Engineer's Inspection: The Engineer will make final inspection:
1. Within 10 days after receipt of certification.
2. Together with Owner and Contractor.

C. Engineer's Determination of Final Completion:
1. Should Engineer consider the Work complete and ready for final payment in accordance with the requirements of the Contract Documents, Engineer shall request Contractor to make Project closeout submittals.
2. Should Engineer consider the Work not complete and ready for final payment:
a. Engineer shall notify Contractor in writing stating the reasons.
b. Contractor:
1) Take immediate steps to remedy the stated deficiencies.
2) Send a second written notice to Engineer certifying that the Work is complete.
c. Engineer and Owner will reinspect the Work.

1.5 REINSPECTION COSTS

A. Should Engineer be required to perform second inspections because of failure of the Work to comply with the original certifications of Contractor, Owner will compensate Engineer for additional services and deduct the amount paid from payment or payments to Contractor.

1.6 ADDITIONAL INSPECTION COSTS

A. Substantial Completion: Owner will compensate Engineer for inspection services rendered between the scheduled date of Substantial Completion and the actual date of Substantial Completion and deduct the amounts paid from payment or payments to Contractor.

B. Final Completion: Owner will compensate Engineer for inspection services rendered between the scheduled date of final completion and the actual date of final completion and deduct the amounts paid from payment or payments to Contractor.

1.7 CLOSEOUT SUBMITTALS

A. Contractor:
1. Provide closeout submittals as required in the Contract Documents.
2. These submittals shall include, but not necessarily be limited to:
a. Project record documents.
b. Operation and maintenance manuals.
c. Guarantees.
d. Spare parts and maintenance materials.
e. Instruction in operation of all systems.

1.8 EVIDENCE OF PAYMENTS AND RELEASE OF LIENS

A. Affidavits:
   1. Submit with final Application for Payment an affidavit of payment of debts and release of claims.
   2. Affidavit shall include:
      a. Contractor's release or waiver of lien.
      b. Consent of surety of final payment.

B. Execution: All submittals shall be duly executed before delivery to Engineer.

1.9 FINAL ADJUSTMENT OF ACCOUNTS

A. Final Statement: Submit a final statement of accounting, which reflects all adjustments, to Engineer. This statement shall contain the following:
   1. Original Contract Price.
   2. Additions and deductions.
   3. Total Contract Price as adjusted.
   4. Previous payments.
   5. Sum remaining due.

B. Final Change Order: Engineer will prepare a final Change Order reflecting approved adjustments to the Contract Price not previously made by Change Orders.

1.10 FINAL APPLICATION FOR PAYMENT

A. Contractor shall submit a final Application for Payment in accordance with the requirements of the Contract Documents.

B. Disposition of Final Application for Payment:
   1. If the final Application for Payment and the Work are acceptable in accordance with the Contract Documents:
      a. Engineer will, within 10 days after receipt of the Application for Payment:
         1) Submit to Owner a written recommendation for payment.
         2) Submit to Owner and Contractor a written notice that the Work is acceptable subject to the provisions of the General Conditions.
      b. Owner will, within 30 days after receipt of the Application for Payment and Engineer's recommendation in accordance with the Contract Documents, pay to Contractor the amount recommended.
   2. If the Application for Payment, the Work or both are unacceptable:
      a. Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment.
      b. Contractor shall make the necessary corrections and resubmit the Application for Payment.
   3. Final Completion Delayed:
      a. Upon receipt of Contractor’s final Application for Payment and recommendation by Engineer, Owner shall make payment of the balance due for that portion of the Work fully completed and accepted if Engineer confirms that final completion of the Work is significantly delayed through no fault of Contractor.
      b. Payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION 01 77 00

SECTION 01 78 39 – PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes procedures for the maintenance, recording and submittal of Project record documents.

1.3 MAINTENANCE OF DOCUMENTS AND SAMPLES

A. Storage:
   1. Store documents and Samples in Contractor's field office apart from documents used for construction.
   2. Provide files and racks for storage of documents.
   3. Provide locked cabinet or secure storage space for storage of Samples.

B. Filing: File record documents in accordance with CSI Masterformat.

C. Maintenance:
   1. Maintain documents in a clean, dry, legible condition and in good order.
   2. Do not use record documents for construction purposes.

D. Availability: Make documents and Samples available at all times for inspection by Engineer.

1.4 RECORDING

A. Labeling: Label each document "PROJECT RECORD" in neat large printed letters.

B. Recording:
   1. Record actual revisions to the Work.
   2. Record information concurrently with construction progress.
   3. Do not conceal any work until required information is recorded.

C. Drawings:
   1. Legibly mark, with notes or graphic representations, to record actual construction.
      a. Horizontal and vertical locations of Underground Facilities and appurtenances, referenced to permanent surface improvements.
      b. Location of internal utilities and appurtenances concealed in the construction, referenced to visible and accessible features of the structure.
      c. Field changes of dimension and detail.
      d. Changes made by Field Order, Work Change Directive or Change Order.
      e. Details not on original Contract Drawings.

1.5 SUBMITTAL

A. Delivery:
   1. At Contract closeout, deliver record documents to Engineer for Owner.
   2. Submit only Contract Documents marked up. Three dimensional models, shop drawings, or other representations of the Project created by the Contractor from the Contract Documents will not be accepted.

B. Transmittal Letter:
   1. Accompany submittal with transmittal letter in duplicate, containing:
      a. Date.
      b. Project title and number.

c. Contractor's name and address.
d. Title and number of each Record Document.
e. Signature of Contractor or their authorized representative.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION 01 78 39

SECTION 02 22 26 – PRECONSTRUCTION AUDIO-VISUAL DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the furnishing of all labor, materials and equipment necessary for a complete color audio-video record of the existing surface features for the entire project to accurately document the pre-construction conditions within the proposed construction's zone of influence.

1.3 SUBMITTALS

A. Qualifications: Submit such information as requested by the Engineer to determine the ability to produce professional video in accordance with industry standards and these specifications.

1.4 QUALITY ASSURANCE

A. Audio-video documentation shall be by a responsible commercial firm regularly engaged in color audio-video construction documentation.

B. Owner reserves the right to reject any audio-video documentation not conforming to these Specifications. Such rejected documentation shall be redone at no additional cost to Owner.

1.5 PRODUCT DELIVERY

A. Deliver to Owner through Engineer premium quality DVD’s, Video CD’s, or Flash hard drive with recorded documentation upon completion of the project or upon completion of segments, if requested.

B. DVD’s shall be compatible with playback on any Region I American TV standard DVD Player.

1.6 SEQUENCING AND SCHEDULING

A. Attend a meeting with Engineer to outline the coverage expected for the project, prior to the start of the video documentation.

PART 2 - PRODUCTS

2.1 Delivered product shall include all digital audio-video discs, disc storage cases, disc index labels, and runsheet logs.

A. Video to be mastered on high quality formats only:
1. CD
2. DVD
3. Flash Drive
4. Portable hard drive

B. High quality camcorders to be used:
1. With 1/4-inch, 1/3-inch or 1/2-inch charged coupled device imaging systems.
2. With optical stabilization; electronic stabilization is not acceptable.
3. With 20x minimum optical magnification.
4. Capable of producing NTSC 525 lines of resolution/60 fields/30 frames per second.
5. Capable of 3-luxillumination minimum.

C. Disc Index Labels:
1. All discs shall be labeled with appropriate project information and be able to be cross referenced with runsheets.

2. Label information to include:
   a. DVD/Video CD number.
   b. Project title.
   c. Location of project.
   d. Month and year of coverage.
   e. Set information, i.e., Engineer's set, Owner's set, Contractor's set.
   f. Quick reference list of contents of a particular DVD.

D. Runsheet Logs:
1. Provide a runsheet log that accurately catalogs the contents of each video.
2. Runsheet logs to include:
   a. Street name, easement or address.
   b. Sheet number or numbers relative to the line entry of a particular area of coverage.
   c. DVD/Video CD numbers.
   d. Real time code indexing for each segment of the project indicating hours minutes and seconds to cross reference with playback equipment to locate specific points of interest on the project.
   e. Direction of travel for each specific segment.
   f. Viewing side for each specific segment.
   g. Starting point for each specific segment.
   h. Ending point for each specific segment.
   i. Project information, i.e. project title, owner, date.

E. Vehicles used while performing documentation to be plainly marked with company name and telephone number with caution signs, flags and strobes to affect a safe and hazard free operation.

PART 3 - EXECUTION

3.1 RECORDING

A. General:
1. Coverage:
   a. Recordings shall include coverage of all surface features located within the zone of influence of the proposed construction.
   b. The zone of influence is defined as the area within the road right-of-way, area within permanent and temporary easements and adjacent areas which may be affected by routine construction operations.
   c. The surface features include, but are not limited to, all roadways, pavements, curbs, driveways, sidewalks, culverts, headwalls, retaining walls, buildings, landscaping, trees, shrubbery, and fences.
   d. Of particular concern shall be the existence or nonexistence of any faults, fractures, or defects.
   e. All recording shall be performed during times of good visibility.
   f. No recording shall take place when there is snow cover on the ground unless authorized by Engineer.
   g. The Engineer may designate areas to be omitted or added for audio-video documentation.
   h. Areas not accessible by conventional wheeled vehicles shall be accessed by walking or special conveyance.
2. Time of Execution: Prior to placement of equipment and materials on the jobsite.
3. Coverage Continuity:
   a. Accessible Areas: Coverage shall consist of a single, continuous, recording which begins at one end of a particular construction area and continues to the other end of that construction area.
   b. Non Accessible Areas (Across Easements, Etc.): Coverage shall consist of an organized, interrelated sequence of recordings at various positions along the proposed construction area.
4. Video portion of the documentation shall reproduce bright, sharp, clear pictures with accurate colors and shall be free from distortion, tearing, rolls or any other form of picture imperfection.
5. Audio Portion of the Documentation:
   a. Shall reproduce the commentary of the camera operator with proper volume, clarity, free from distortion and background noise.
   b. Assist in maintenance of viewer orientation and in identification, clarification, or objective description of the structures being shown in the video portion of the recording.

6. Video shall display through electronic means information germane to the current video display.
   a. Display continuously information as follows:
      1) Time and date of recording.
      2) Location of recording, i.e., street name, easement or address.
   b. When conventional wheeled vehicles are utilized, include engineering stationing to coincide with project plans, direction of travel and viewing side.
      1) The engineering stationing must be continuous and accurate and reflect the stationing within the field of view.
      2) The engineering stationing must coincide with stationing on project plans and utilize standard engineering symbols, i.e., 5+00.
      3) Global Positioning System satellites may be used with or in place of engineering stationing.
         a) Differential Global Positioning System is to be used where available, with updates 1/second at 5 meter or less spherical accuracy.
         b) Standard Global Positioning System accuracy is as dictated by the United States Department of Defense mandate.
         c) Global Positioning System display will be at 1 meter longitude and 1 meter latitude increments, i.e., 414N529 08317W302.

B. Procedural Requirements for Coverage Rates:
   1. The following table sets the maximum rate of travel for the following areas:

AREA	AVE RATE MAX
Along the entire route of the proposed raw water main including but not limited to M-43, Degroff Street, Franklin Street, East River Street and the City Park.	60 ft/min

   2. Camera Positioning and Techniques:
      a. Height and Stability: Camera to be mounted securely to produce steady viewing with lens not less than 8 feet above the ground of the area being viewed, or at a level to facilitate best perspective and line of site when using conventional wheeled vehicles.
      b. Control: All movements shall be at a rate that allows recorded objects to be viewed clearly during video playback.
      c. Viewer Orientation for Road Areas: Utilize overall establishing views and visual displays of all visible house and building addresses.
         1) Easement Areas: Highly visible yellow flags shall be used to clearly define proposed centerline of construction.
   3. Private Property:
      a. Contractor shall obtain permission of property owner before entering private property.
      b. If Contractor is refused entry to private property, Contractor shall notify Engineer and wait until permission is obtained before entering the property.

END OF SECTION 02 22 26

SECTION 03 30 03 – CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the furnishing and installation of formwork, reinforcement and concrete.

1.3 REFERENCES

A. Except as herein specified or as indicated on the Drawings, the work of this Section shall comply with the following:
   1. ACI - American Concrete Institute:
      a. 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete.
      b. 301 - Specifications for Structural Concrete.
      c. 304R - Guide for Measuring, Mixing, Transporting and Placing Concrete.
      d. 305R - Hot Weather Concreting.
      e. 306R - Cold Weather Concreting.
      f. 309R - Guide for Consolidation of Concrete.
      g. 318 - Building Code Requirements for Structural Concrete.
      h. 347R - Guide to Formwork for Concrete.
   2. ASTM Standard Specifications, Test Methods, and Classifications:
      a. A185 – Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.
      b. A615 - Specification for Deformed and Plain Billet - Steel Bars for Concrete Reinforcement.
      c. A1064 - Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
      d. C31 – Practice for Making and Curing Concrete Test Specimens in the Field.
      e. C33 - Specification for Concrete Aggregates.
      f. C39 - Test Method for Compressive Strength of Cylindrical Concrete Specimens.
      g. C94 - Specification for Ready-Mixed Concrete.
      h. C138 – Test Method for Density (Unit Weight), Yield and Air Content (Gravimetric) of Concrete.
      i. C143 – Test Method for Slump of Hydraulic-Cement Concrete.
      j. C150 - Specification for Portland Cement.
      k. C172 - Practice for Sampling Freshly Mixed Concrete.
      l. C173 - Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
      m. C231 - Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
      n. C260 - Specification for Air-Entraining Admixtures for Concrete.
      o. C309 - Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
      p. C494 - Specification for Chemical Admixtures for Concrete.
      q. C595 – Blended Hydraulic Cement.
   3. MDOT Publications:
      a. Standard Specifications for Construction.
      b. Standard Plans.

1.4 DESIGN AND PERFORMANCE REQUIREMENTS

A. Formwork: Perform the design and engineering of formwork, as well as its construction.

1.5 SUBMITTALS

A. Shop Drawings: For reinforcing steel.

B. Mix Designs: Submit for review prior to placing concrete.

1.6 QUALITY ASSURANCE

A. Concrete Material Testing:
   1. Contractor shall provide the services of an independent concrete testing laboratory.
   2. Point of sampling and method of sampling: In accordance with ASTM C172.
   3. Slump Tests:
      a. Perform slump tests in accordance with ASTM C143.
      b. Perform one slump test on the Site for each load of concrete.
   4. Perform 1 air-entraining test in accordance with ASTM C231 or C173 for each load of concrete.
   5. Test the concrete unit weight in accordance with ASTM C138.
   6. Concrete Cylinder Testing:
      a. In accordance with ASTM C31 and C39.
      b. Take concrete cylinder Samples for each load of concrete.
      c. Concrete cylinder Sample shall consist of a minimum of four 4x8 or 6x12 cylinders.
      d. Handle cylinders carefully.
      e. On Site Storage:
         1) 12 hours, minimum, 48 hours maximum.
         2) At a temperature range of 60 to 80 degrees F and in a moist environment.
         3) Shielded from direct sunlight and radiant heat.
         4) Construct heated or water bath enclosures, as applicable, if conditions require.
      f. Provide laboratory curing for duration of curing after on Site storage.
      g. Test 1 of the cylinders at 7 days and 2 cylinders at 28 days. Save 1 cylinder as a spare.
      h. Acceptance and evaluation of the concrete shall be based on ACI 301.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Formwork:
   1. Form grade plywood or metal panels; no torn edges or worn plywood.
   2. Form Release Agent: Non-staining, non-emulsifiable type.
   3. Form ties, spreaders, and accessories as required by the formwork design.
   4. Provide chamfered strips in exposed corners of concrete.

B. Reinforcement:
   1. Reinforcing Bars:
      a. ASTM A615.
      b. Yield Stress: F_y = 60,000 psi, Grade 60.
   2. Welded Wire Fabric:
      a. ASTM A185 or A1064.
      b. Yield Stress: F_y = 65,000 psi.
   3. Accessories resting on surfaces to be left exposed as finished surfaces shall have plastic coated legs.

C. Concrete Materials:
   1. Portland Cement: ASTM C150, Type I, or A595, Type 1L.
   2. Fly Ash: ASTM C618, Class F.
   3. Ground-Granulated Blast Furnace (GGBF) Slag: ASTM C989, Grade 100 or 120.
      a. Fine and Coarse Aggregates: Inert, non-chemically reactive, and non-radioactive.
      b. Conforming with ASTM C33.
   4. Water: Clean, fresh, and potable.
   5. Air-Entrainment:
      a. ASTM C260.
      b. For all concrete mixes except interior floor slabs and pads.
   6. Water Reducing Agents: ASTM C494.
   7. No calcium chloride allowed in materials used in concrete mix.
   8. Membrane Curing Compounds: ASTM C309.

2.2 CONCRETE MIXES

A. Proportioning:
1. Proportions of materials for concrete shall be in accordance with ACI 211.1.
2. Mix Design :
a. Minimum Design Compressive Strength: 4,000 psi.
b. Minimum Cementitious Content: 5.5 sacks.
c. Replacement of Cement by Fly Ash or Slag: Permitted, up to 20% combined .
d. Water-Cementitious Ratio: 0.52 maximum.
e. Slump Limits: 4 inches ± 1-inch before addition of water reducer, if any.
f. Entrained Air Content: 6% ± 1%.

2.3 SOURCE QUALITY CONTROL

A. Production and Delivery:
1. Batch, mix and transport ready mixed concrete in accordance with ASTM C94.
2. Furnish ready-mix delivery tickets with each batch of concrete before unloading at the Site, on which is printed, stamped or written the following information:
a. Name of ready-mix batch plant.
b. Serial number of ticket.
c. Date and truck number.
d. Name of Contractor.
e. Project name and location.
f. Specific class of designation of concrete.
g. Amount of concrete (cubic yards).
h. Time loaded or of first mixing of cement and aggregates.
i. Type, name and amount of admixture.
3. Minor amounts of concrete may be mixed on Site with prior review by Engineer.

PART 3 - EXECUTION

3.1 ERECTION AND PLACEMENT

A. Forms:
1. Provide required forms, shores, bracing, breast timbers, form ties and accessories in sufficient quantities so as not to delay the work.
2. Coordinate work with other trades for the installation of embedded items and form penetrations.
3. Form Removal:
a. No earlier than 3 days for columns and walls.
b. No earlier than 7 days for beams and slabs.

B. Reinforcement:
1. Free from rust scale, loose mill scale, oil, paint, and other coatings which will destroy or reduce bond between steel and concrete at the time concrete is placed around it.
2. Notify Engineer 24 hours prior to concrete pour for final check of reinforcing placement.

C. Concrete:
1. Handle concrete from mixer to place of final deposit in carts, buggies or conveyors.
2. Compact concrete by mechanical vibration equipment, but do not transport concrete through forms by vibrating.
3. Concrete Finish:
a. Formed Surfaces: As cast, smooth formed finish.
b. Unformed Exposed Surfaces:
1) Interior: Smooth troweled finish unless specified otherwise.
2) Exterior: Light broomed finish unless specified otherwise.
4. As soon as possible after finishing or removing forms, treat surfaces with a liquid membrane-forming curing compound unless specified otherwise.
5. Protect freshly placed concrete from damage due to extreme temperatures in accordance with ACI 305R and ACI 306R.

END OF SECTION 03 30 03

SECTION 26 05 00 – COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Excess Quantities and Sizes: Where quantities, sizes or other requirements on Drawings or Specifications are in excess of code requirements, Drawings or Specifications govern.

C. Conflicts: When conflicts exist between referenced Specifications or standards, more stringent requirements govern. No extra compensation for such compliance allowed.

1.2 SUMMARY

A. This Section includes the following:
   1. Electrical equipment coordination and installation.
   2. Penetrations for raceways and cables.
   3. Penetration seals.
   4. Grout.
   5. Duct seal.
   6. Duct sealing plugs.
   7. Common electrical installation requirements.

1.3 REFERENCES

A. Except as herein specified or as indicated on the Drawings, the work of this Section shall comply with
   1. NECA 1 - Standards Practices for Good Workmanship in Electrical Construction.
   2. NEC – National Electrical Code (NFPA 70).

1.4 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

1.5 SUBMITTALS

A. Product Data: For sleeve seals.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original, unbroken, brand marked containers or wrapping as applicable.

B. Handle and store materials in a manner which will prevent deterioration, damage, contamination with foreign matter, and damage by weather or elements, and according to Manufacturer's directions.

C. Store materials indoors and protect from weather. When necessary to store outdoors, elevate materials above grade and enclose with durable, weather tight wrapping.

D. Reject damaged, deteriorated or contaminated material and immediately remove from the Site. Replace rejected materials with new materials at no additional cost to Owner.

1.7 COORDINATION

A. Coordinate arrangement, mounting, and support of electrical equipment:
   1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
   2. To ensure that mounting heights and locations of electrical equipment do not interfere with all other building appurtenances such as, but not limited to, containment areas, special coatings, and other equipment.
   3. To allow easy access and disconnection of electrical equipment while ensuring the least amount of interference with other installations.
   4. To allow right-of-way for piping and conduit installed at required slopes.
   5. To ensure that connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and outside of the dedicated working and access space of other equipment.

B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

PART 2 - PRODUCTS

2.1 SLEEVES FOR RACEWAYS AND CABLES

A. Steel Pipe Sleeves: ASTM A53/A53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

2.2 PENETRATION SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Advance Products & Systems, Inc.
      b. Calpico, Inc.
      c. Metraflex Co.
      d. Pipeline Seal and Insulator, Inc.
      e. Proco Products, Inc.
   2. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
   3. Pressure Plates: Stainless steel.
   4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3 GROUT

A. Coordinate the selection and application of grout with other trades in order to match the color and properties of the surface being repaired, where applicable. In existing construction, grout shall match existing color and material properties.

B. At a minimum grout shall be:
   1. Nonshrink; recommended for interior and exterior for sealing openings in non-fired-rated walls or floors.
   2. Standard: ASTM C1107, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
   3. Design Mix: 5,000 psi, 28 day compressive strength.
   4. Packaging: Premix and factory packaged.

2.4 DUCT SEAL

A. Description: UL listed, pliable, non-hardening, non-corrosive, weather-proof putty material, designed as a moisture barrier for weather-sealing service entries, electrical cables, and conduit ducts.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Arnco Corp. - Hydra-Seal.
      b. Ilsco Corp. – DS Duct Seal.
      c. JM Clipper – Duxseal.

d. OZ/Gedney Co. – DUX.
e. RectorSeal - Duct Seal Compound.
f. Thomas & Betts Corp. - DX.
g. Or equal.

2.5 DUCT SEALING PLUGS

A. Cable duct sealing plugs shall be designed to effectively seal conduits, reducing the cost of cable placement and maintenance in underground construction projects and routine work.
1. All plastic construction – corrosion proof.
2. Pull 'Rope Eye' attachment (can be supplied with security hex nut).
3. Water tight.
4. Simple to install.
5. Removable and reusable.
6. Full range of sizes.
7. Full range of forms (round, square).
8. Full range of supported cable count (simplex, duplex, triplex, quadplex and specials).

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. TE Connectivity.
2. Innerduct.
3. CalAm.
4. Or equal.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

A. Comply with NECA 1 and NEC.

B. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in a manner as to facilitate future disconnecting with minimum interference with other items in the vicinity.

D. Right of Way: Give to piping systems installed at a required slope.

3.2 INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate:
1. Exterior walls or slabs.
2. Fire-rated floor and wall assemblies.
3. Interior non-rated floor and wall assemblies.

B. Use core drilled holes, formed openings, or pipe sleeves for all penetrations unless penetration arrangement requires a rectangular sleeved opening or otherwise indicated herein or on the Drawings.
1. When using a pipe sleeve:
a. Use cast-iron pipe sleeves with integral water stop in new construction only. Coordinate installation of pipe sleeve with wall/slab construction.
b. Use steel pipe sleeve in existing construction or new above grade interior construction.
2. Obtain approval from Engineer before using rectangular sleeved openings not indicated on the Drawings.

C. Pipe Sleeve Installation:
1. In walls, cut sleeves to length for mounting flush with both surfaces of walls.
2. In floors, extend sleeves installed in floors 2 inches above finished floor level.

3. Size sleeve to provide a minimum 1/4-inch annular clear space between sleeve and raceway or cable, unless otherwise indicated herein or on the Drawings. When using a modular mechanical seal, provide annular space between sleeve, raceway, or cable as required by seal Manufacturer.
4. Seal space outside of sleeves. Seal shall match existing surface construction and properties. When grout or similar compound is used promptly pack solidly between sleeve and wall so no void remains. Tool exposed surfaces smooth; protect while curing.

D. Penetration Types:
   1. Fire-Rated Assembly Penetrations:
      a. Apply firestopping to penetrations to maintain fire rating of walls, partitions, ceilings, and floors at penetrations. Seal penetration with firestop materials.
      b. Reference Architectural Drawings and/or Owner Record Drawings for fire ratings of walls and floors.
   2. Interior Penetrations of Non-Fire-Rated Walls and Floors:
      a. Seal annular space between penetration and raceway or cable, using joint sealant appropriate for size, depth, and location of joint.
      b. Repair surface to match finish and properties of penetrated surfaces.
   3. Roof-Penetrations:
      a. Roof penetrations shall be made using RMC.
      b. Seal annular space between penetration and raceway or cable, using joint sealant appropriate for size, depth, and location of joint.
      c. For new roofing installation penetrations, seal all penetrations of individual raceways as required by the roofing Manufacturer to maintain the roof warranty. Coordinate work with other trades.
      d. For existing roofing installation penetrations, Seal all penetrations of individual raceways with flexible boot-type flashing units.
      e. Roof penetrations shall require the installation of duct sealing plugs in raceways. Duct seal shall be used when duct sealing plugs are not available in the size or configuration required.
   4. Exterior-Wall and Elevated Slab Penetrations:
      a. Seal penetrations using mechanical modular seals. Size penetrations as required to install mechanical modular seal.
      b. Exterior penetrations shall require the installation of duct sealing plugs. Duct seal shall be used when duct sealing plugs are not available in the size or configuration required.
      c. Repair surface to match finish and properties of penetrated surfaces.
   5. Manhole and Vault Penetrations:
      a. Seal penetrations using mechanical modular seals. Size penetration as required to install mechanical module seal.
      b. Manholes and vault penetrations shall require the installation of duct sealing plugs. Duct seal shall be used when duct sealing plugs are not available in the size of configuration required.
      c. Repair surface to match finish and properties of penetrated surfaces.
   6. Varied Temperature Penetrations:
      a. Penetrations where raceways will be simultaneously exposed to different temperatures on each side of the penetration such as freezers, coolers, or room to room where the temperature variation is greater than 10 degrees Fahrenheit and one side of the room will be 60 degrees or less.
      b. Seal penetrations using mechanical modular seals where penetrated material permits. Size penetrations as required to install mechanical modular seal. Where modular mechanical seals cannot be utilized use clear silicone caulk or grout as applicable.
      c. Inside of the raceway shall be sealed with duct sealing plugs. Duct seal shall be used when duct sealing plugs are not available in the size of configuration required.
      d. Repair surface to match finish and properties of penetrated surfaces.

3.3 PENETRATION SEAL SYSTEM INSTALLATION

A. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of penetration. Assemble modular mechanical seals and install in annular space between raceway or cable and penetration. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.4 DUCT SEAL INSTALLATION

A. Install duct seal materials in strict accordance with the Manufacturer’s instructions.

B. Obtain approval from Engineer prior to installing duct seal as the application may require duct sealing plugs to be utilized in lieu of duct seal.

3.5 DUCT SEALING PLUG INSTALLATION

A. Where conduits penetrate into the building, seal duct openings at conduit termination points with duct sealing plugs for all conduits entering the building to prevent migration of water and gases into the building and to prevent the condensation of water vapor inside the enclosures where the conduits terminate.

B. Duct sealing plugs shall be applied after all cables have been installed.

C. Install duct sealing plug materials in strict accordance with the Manufacturer's instructions.

D. All open-ended riser conduits shall require duct sealing plugs to be installed.

END OF SECTION 26 05 00

SECTION 26 05 20 – CONDUCTORS AND CABLES – 600V AND BELOW

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections apply to this Section.

1.2 SUMMARY

A. This Section includes the furnishing and installation of all electrical conductors, cables, splices, and connectors.

B. Major Systems Include:
   1. 600V and below service entrance, feeders and electrical distribution.
   2. Branch circuit wiring.
   3. System wiring.

1.3 REFERENCES

A. Except as herein specified or as indicated on the Drawings, the work of this Section shall comply with the standards of the following organizations as applicable to materials, construction and testing of wire cables:
   1. NEMA - National Electrical Manufacturer Association Standards.
   2. IEEE Standards.
   3. Insulated Cable Engineers Association - Standards.
   4. ASTM Standards.
   5. NEC - National Electrical Code (NFPA 70).

1.4 QUALITY ASSURANCE

A. Fabrication and Installation Personnel Qualifications:
   1. Trained and experienced in the fabrication and installation of the materials and equipment.
   2. Knowledgeable of the design and the reviewed submittals.

B. Manufacturers: Firms regularly engaged in the manufacture of electrical conductor and cable products of the types and ratings required, whose products have been in satisfactory use in similar service for not less than 5 years.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver all materials in original, unbroken, brand marked containers or wrapping as applicable.

B. Handle and store materials in a manner which will prevent deterioration or damage, contamination with foreign matter, damage by weather or elements, and in accordance with Manufacturer's directions.

C. Store materials indoors and protect from weather. When necessary to store outdoors, elevate materials above grade and enclose with durable, watertight wrapping.

D. Reject damaged, deteriorated, or contaminated materials and immediately remove from the Site. Replace rejected materials with new materials at no additional cost to Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Except as otherwise indicated, provide conductors, cables, and connectors of Manufacturer's standard materials, as indicated by published product information; designed and constructed as recommended by the Manufacturer and as required for the installation.

B. Power Wire:
1. All conductors and cables shall be new with a minimum wire size of No. 12 AWG. Manufacturer's name, type, and size shall be permanently marked on the outer covering at regular intervals and delivered in complete coils or reels.
2. Provide factory fabricated conductors of size, rating, material, and type as indicated for each service. Where not indicated, provide proper selection as determined by installer to comply with installation requirements and with NEC standards, from only the following types and conductors:
   a. Type THHN/THWN-2 dual rated, 600-Volt, 90 degrees C rated. Stranded copper for all sizes.
   b. Bare Conductors: Stranded copper for all sizes.

C. Control Cable: No. 14 AWG minimum, type THHN/THWN-2.

D. Instrumentation Signal Cable:
1. No. 16 AWG stranded, tinned copper conductors, 600V polyethylene insulation, twisted pair, 100% coverage aluminum polyester shield, No. 18 AWG stranded, tinned copper drain wire with vinyl outer jacket, UL listed.
2. 600V rated for outdoor or below grade installations.
3. 300V rated indoors, above grade or inside control panels.
4. Manufacturers: Belden; Alpha; West Penn, General Cable.

E. Unshielded Twisted Pair (UTP) Cabling:
1. Multi-conductor, Enhanced Category 6, nonbonded-pair cable consisting of 4 pairs of 23 AWG solid bare copper conductors with flame retardant polyolefin/fluorinated ethylene propylene (FRPO/FEP) insulation, tape separator, and low smoke polyvinylchloride (LS PVC) outer jacket with ripcord. Outer jacket shall be blue.
2. Suitable for Gigabit Ethernet and 100BaseTX applications.
3. UL CMP (plenum) rated.

F. Power Wiring Cable Accessories: For Connectors:
1. Wing nuts by Ideal.
2. Sta-Kon by Thomas & Betts.
3. Scotchlox Spring by Minnesota Mining & Manufacturing Company.
4. Compression Type 53200 by Thomas & Betts.
5. Hydent by Burndy.
6. Insulated multi-cable mechanical connector blocks by Polaris, or Ilsco.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:
1. Install electrical conductors, cables, and connectors as indicated on the Drawings, in accordance with the Manufacturer's written instructions, the applicable requirements of NEC and the National Electrical Contractors Association's "Standard of Installation," and in accordance with recognized industry practices to ensure that products serve the intended functions.
2. Conductors and cables shall be sized in accordance with the Drawings or, in the absence thereof, in accordance with NEC requirements. Except where indicated herein, conductor sizes greater than No. 12 AWG are indicated on the Drawings.
3. Provide a dedicated grounded conductor (neutral) for each circuit that requires a neutral for proper operation. Unless indicated otherwise on the Drawings, shared neutrals are not allowed.

4. Provide an equipment grounding conductor in all raceways. Conductor shall be sized in accordance with the National Electrical Code.

B. Voltage Drop Compensation:
   1. Provide No. 10 AWG conductors in lieu of No. 12 AWG conductors to compensate for voltage drop as follows:
      a. For each 277V, 20 ampere branch circuit that exceeds 200 feet in length between the branch circuit panelboard and the last outlet.
      b. For each 120V, 20 ampere branch circuit that exceeds 100 feet in length between the branch circuit panelboard and the last outlet.
   2. When conductor size is increased to compensate for voltage drop, provide equipment grounding conductor increased in size in accordance with NEC.

C. Installation Procedures:
   1. Install interior conductors after building is enclosed and water tight.
   2. Each conduit shall be free of moisture and debris before conductors are installed.
   3. Remove moisture from conduits by swabbing.
   4. Install conductors so insulation is not damaged. Replace all conductors that are damaged.
   5. Install conductors and cables only in code conforming raceway.
   6. Pull conductors together where more than one conductor is being installed in a raceway.
   7. Use heat shrink tubing for all instrument signal cable terminations.
   8. Twist all un-jacketed instrument signal cables to within 1/2-inch of terminals.
   9. Use manufacturer-approved pulling compound or lubricant, where necessary. Compound shall not deteriorate conductor and insulation. Compounds shall be UL listed.
   10. Use a pulling means, including fish tape, cable or rope, and basket-weave wire/cable grips that will not damage the raceway or the wire.
   11. Keep conductor splices to a minimum.
   12. Install splices and taps which have equivalent or better mechanical strength and insulation as the conductor.
   13. Use splice and tap connectors which are compatible with the conductor material.
   14. Make all joints, splices, and connections only at accessible junction or outlet boxes, never inside conduit or fitting. Make splices in No. 10 AWG and smaller wire with insulated spiral mechanical connectors.
   15. Make splices in No. 8 AWG and larger copper wire with compression type mechanical connectors.
   16. All splices located in handholes and wet locations shall be rated for wet locations.
   17. Low voltage and signal cable splices located in handholes and wet locations shall be sealed in 2-part epoxy sealing pack, 3M Scotchcast connector sealing pack 3570G.
   18. Insulate all joints at splices with "Scotch" brand electrical pressure sensitive tape to 150% of conductor insulation value.
   19. Make conductor length for parallel feeds identical.
   20. Where exposed cables are installed, cables shall be installed parallel and perpendicular to exposed structural members and building lines.
   21. Do not lace, strap or tie feeder or branch circuit conductors together in panels, switchboards, variable speed drives, motor control centers, automatic transfer switches, boxes, and wireways.
   22. All conductors and cables shall be identified in accordance with Division 26 Section “Identification for Electrical Systems.”
   23. Use color coded conductors as follows:
      a. Phases: Black-red-blue (under 150V to ground).
      b. Phases: Brown-orange-yellow (over 150V to ground).
      c. Neutral: White (under 150V to ground).
      d. Neutral: Grey (over 150V to ground).
      e. Ground: Green identified (feeders); Green (branch circuits).
   24. Support conductors in vertical raceways in accordance Division 26 Section “Hangers and Supports for Electrical Systems.”
   25. Outlets:
      a. Leave at least 6 inches of free conductor at all outlets except where conductors are intended to loop without joints through outlets for fixtures or wiring device hook-ups.
      b. Free ends and loops at boxes and enclosures shall be pushed back into boxes and protected by blank cover plates or other means until interior painting and decorating work is completed.

26. Lights and outlets shall be grouped on circuits as indicated on the Drawings. Different types of circuits such as feeders, branch circuits, control circuits, and signal circuits, shall not be mixed in common conduit runs, but shall be run separately, although more than 1 circuit of the same system may be run in common conduit runs.
27. Conductor ampacity derating shall be adhered to for all conductors in accordance with the National Electrical Code.
28. Type MC Cable shall not be used.
29. UTP Cable Installation:
    a. Comply with TIA/EIA-568-B-2.
    b. Install 110-style IDC termination hardware unless otherwise indicated.
    c. Do not untwist UTP cables more than 1/2-inch from the point of termination to maintain cable geometry.

3.2 FIELD QUALITY CONTROL

A. General:
1. Prior to energization, check conductors and cables for continuity of circuitry and for short circuits. Correct malfunctions when detected.
2. Subsequent to conductor and cable hook-ups, energize circuitry and demonstrate functioning in accordance with requirements.

END OF SECTION 26 05 20

SECTION 26 05 29 – HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the furnishing and installation of the following:
   1. Hangers and supports for electrical equipment and systems.

1.3 DEFINITIONS

A. Electrical Supports: Angles, channels, brackets, and mounting accessories for supporting all conduit, luminaires, switches, and other electrical equipment which are hung or mounted above floor.

1.4 DESIGN AND PERFORMANCE REQUIREMENTS

A. This Section defines general criteria for the selection and installation of supporting devices but does not cover all types specifically required for the Project.

B. Choose or design supporting devices in accordance with these general criteria.

1.5 QUALITY ASSURANCE

A. Fabrication and Installation Personnel Qualifications:
   1. Trained and experienced in the fabrication and installation of the materials and equipment.
   2. Knowledgeable of the design and the reviewed submittals.

B. Regulatory Agencies Requirements:
   1. Provide supporting devices listed by Underwriters' Laboratory for their application as installed.
   2. Comply with National Electrical Code (NFPA 70) as applicable to construction, installation, and requirements for supporting devices.
   3. Comply with Metal Framing Manufacturers Association Standard Publication (MFMA-4); factory-fabricated components for field installation.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver all materials in original, unbroken, brand marked containers or wrapping as applicable.

B. Handle and store materials in a manner which will prevent deterioration or damage, contamination with foreign matter, damage by weather or elements, and in accordance with Manufacturer’s directions.

C. Store materials indoors and protect from weather. When necessary to store outdoors, elevate materials above grade and enclose with durable, watertight wrapping.

D. Reject damaged, deteriorated, or contaminated material and immediately remove from the Site. Replace rejected materials with new materials at no additional cost to Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Conduit Supports:
1. Where information indicated on Drawings conflicts with information herein, the more stringent requirements shall take precedence and the better quality or greater quantity of work shall be provided.
2. Single Runs: Galvanized conduit straps or ring bolt type hangers with spring clips. Do not use plumber's perforated straps.
3. Use PVC coated steel (40 mil thickness) corrosive areas. All hardware used in corrosive areas shall be 316 stainless steel.
4. All supports, such as, but not limited to, metal channel (strut) framing systems, angles, straps, hangers, etc. shall match the raceway type that is being supported. For example, galvanized conduit requires galvanized metal channel (strut) framing systems and straps, PVC coated conduit requires PVC coated metal channel (strut) framing systems and straps, PVC conduit requires PVC channel (strut) framing systems and straps.
5. In general, all hardware, such as anchors, nuts, bolts, washers, threaded rod, etc. shall match the conduit type: Galvanized steel hardware shall be used with galvanized steel rigid metal conduit; 316 stainless steel hardware shall be used with PVC and PVC coated rigid metal conduit.
6. Multiple Runs: Conduit rack with 25% spare capacity.
7. Vertical Runs: Channel support with conduit fittings.
8. Manufacturers:
   a. Cooper B-Line; a division of Eaton Corporation.
   b. ERICO International Corporation.
   c. Power-Strut; Power Engineering Co., Inc.
   d. GS Metals Corp.
   e. Michigan Hanger Co., Inc.; O-Strut Div.
   f. National Pipe Hanger Corp.
   g. Thomas & Betts Corporation.
   h. Unistrut; a brand of Atkore International, Inc.
   i. Wesanco Channel Systems; ZSi-Foster, Inc.
   j. Or equal.

B. Mounting, Anchoring, and Attachment Components
1. Mechanical-Expansion Anchors: Insert-wedge-type, 316 stainless steel, for use in hardened Portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials where used. See item 2.1 A 5 above for clarification.
2. Manufacturers:
   a. Hilti, Inc.
   b. ITW Construction Products.
   c. MKT Fastening, LLC.
   d. Or equal.

C. Supports for Conductors in Vertical Conduit:
1. Install in compliance with NEC article 300.19.
2. Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:
1. Layout to maintain headroom, neat mechanical appearance, and to support equipment loads.
2. Secure Engineer's approval before welding or bolting to steel framing or anchoring to concrete structure.

3. Where equipment is to be suspended from cast-in-place concrete construction, set approved concrete inserts in formwork to receive hanger rods. Where equipment is to be suspended from metal deck and beam or joist construction, support equipment from beams or joists only.
4. Do not use existing supports without approval from Engineer and Owner.

END OF SECTION 26 05 29

SECTION 26 05 34 – RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the furnishing and installation of conduits and fittings for electrical wiring.

1.3 SUBMITTALS

A. PVC Coated RMC Installers: Submit Manufacturer’s certified training record (i.e., sign-in sheet on Manufacturer’s letterhead) for all employees trained and certified to install PVC Coated RMC.

1.4 QUALITY ASSURANCE

A. Fabrication and Installation Personnel Qualifications:
   1. Trained and experienced in the fabrication and installation of the materials and equipment.
   2. Knowledgeable of the design.

B. Regulatory Agencies Requirements:
   1. ACI – American Concrete Institute: Standards pertaining to conduits embedded in concrete (Section 6.3 in ACI 318 – Building Code Requirements for Structural Concrete and Section 6.3 in ACI 350R – Environmental Engineering Concrete Structures.)
   2. NEMA – National Electrical Manufacturer's Association – Standards pertaining to raceways.
   3. NEC – National Electric Code – As applicable to construction and installation of conduit system.
   4. Provide conduit which is listed and labeled by Underwriters' Laboratories.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver all materials in original, unbroken, brand marked containers or wrapping as applicable.

B. Handle and store materials in a manner that will prevent deterioration or damage (e.g., bending, end damage, finish scoring), contamination with foreign matter, damage by weather or elements, and in accordance with Manufacturer's directions.

C. Store materials indoors and protect from weather. When necessary to store outdoors, elevate materials above grade and enclose with durable, watertight wrapping. Provide color coded end cap thread protectors on exposed threads of threaded metal conduit.

D. Reject damaged, deteriorated, or contaminated material and immediately remove from the Site. Replace rejected materials with new materials at no additional cost to Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Rigid Metal Conduit (RMC):
   1. Galvanized Steel RMC: Galvanized steel, heavy wall conduit with threaded fittings, 3/4-inch trade size minimum, insulated bushings.

B. Rigid Nonmetallic Conduit (RNMC):
   1. Schedule 40, rigid polyvinylchloride, rated for 90 degrees C conductors, 3/4-inch trade size minimum, solvent cement connectors and couplings.
   2. Nonmetallic strap hangers allowing thermal expansion movement.
   3. Conduit to meet NEMA TC-2; fittings to meet NEMA TC-3.
   4. Expansion Coupling: Nonmetallic to compensate for thermal expansion.

C. Liquid Tight Flexible Metal Conduit (LTFMC): 3/4-inch trade size minimum. Flexible conduit with flexible, moisture-proof PVC jacket and liquid tight connectors.
   1. In Corrosive Locations, LTFMC fittings shall be nonmetallic.

D. Encased Burial (EB): PVC, rated for 90 degree C conductors, 2-inch to 6-inch trade size, solvent cement connectors and couplings. Meet NEMA TC-6 and TC-8.

E. PVC Coated RMC:
   1. Galvanized Steel RMC with a minimum of 40 mil PVC exterior coating and 2 mil urethane internal coating.
   2. Manufacturers:
      a. Robroy Industries: Plasti-Bond RED.
      b. Perma-Cote Industries: Perma-Cote Standard.
      c. OCAL, Inc.: OCAL-BLUE.
      d. Calbond: Calpipe Industries.
   3. Fittings, conduit bodies, outlet boxes, hangers, supports, straps, and accessories shall be products of the same Manufacturer and shall be coated with a minimum of 40 mil PVC exterior coating and 2 mil urethane internal coating.
   4. Finished conduit shall fully conform to the current NEMA Standard RN-1 and shall have a label affixed indicating compliance with UL Standard No. 6.

F. Innerduct:
   1. Flexible, multi-cell, textile innerduct.
   2. Melting Point: 480 degrees F (minimum).
   3. Tensile Strength: 2,500 pounds (minimum)
   4. Size and number of cells as indicated on the Drawings.
   5. With pre-installed, color coded pull tapes.
   6. Manufacturer: MaxCell; or equal.

G. Joint Compound for RMC and IMC: Listed for use in cable connector assemblies, and compounded for use to lubricate and protect threaded raceway joints from corrosion and enhance their conductivity.

H. Conduit Hubs for RMC:
   1. Suitable for environment served.
   2. Grounding screw.
   3. O-ring gasket.
   4. Material: Stainless steel Type 316.
   5. Manufacturer:
      a. Cooper Myers Hubs.
      b. Thomas & Betts.
      c. Killark.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Unless otherwise specified or indicated on the Drawings, conduit shall be installed exposed (surface mounted).

B. Install conduit products in accordance with:
   1. The Drawings.
   2. The Manufacturer's written instructions.

3. Applicable requirements of NEC and National Electrical Contractors Association's "Standard of Installation."
4. Recognized industry practices to ensure that products serve intended function.

C. Conduit Joints: Cut square, reamed smooth and drawn up tight.

D. Threaded Conduit Joints: Apply listed anti-corrosion/anti-seize compound to threads of raceway and fittings before making up joint. Follow compound manufacturer's written instructions.

E. Bends:
1. Number per run for conduit that support feeder and branch circuits: Do not exceed the equivalent of 4 quarter bends (360 degrees) between pull points.
2. Number per run for conduit that supports data/communications cabling: Do not exceed the equivalent of 2 quarter bends (180 degrees) between pull points.
3. Make bends and offsets so as not to reduce the inner diameter of the conduit.
4. To the extent possible, avoid using large junction boxes as 90 degree junctions.

F. Routing:
1. Concealed Conduits: Run in a direct line with long sweep bends and offsets.
2. Exposed Conduits: Run parallel to, and at right angles to, building lines.
3. Run continuous from outlet to outlet and from outlets to cabinets, pull or junction boxes.
4. Secure to boxes and cabinets with locknuts and bushings in such a manner that each system is electrically continuous throughout.

G. Cap conduit ends to prevent entrance of foreign materials during construction.

H. Provide insulated bushings on threaded conduit run terminations. Where entering the bottom of open-bottom switchboards, motor control centers, transformers, primary switches, and similar equipment provide bonding bushings and bonding jumpers.

I. Where entering the bottom of open-bottom equipment (i.e., switchboards, panelboards, motor control centers, transformers, and similar equipment) conduit shall not be installed flush with the floor/equipment pad and shall not rise more than 3 inches above the bottom of the enclosure.

J. Conduit entering control panels shall not obstruct internal components and shall allow for neat and workmanlike wire management.

K. Completely install conduit systems before installing conductors.

L. Refer to Division 26 Section "Common Work Results for Electrical" for sealing underground and above grade conduit that is exposed to temperature differences to prevent the passage of air and condensation.

M. Support:
1. Where information on Drawings conflicts with information herein, the more stringent requirements shall take precedence and the better quality or greater quantity of work shall be provided.
2. Adequately support conduit from structural elements of the building.
3. Do not drill or tap structural building steel without approval from Engineer.
4. Do not rest raceways or wiring systems on, nor support it from, ceiling suspension systems, ceiling tiles or mechanical equipment including, but not necessarily limited to ductwork and fans.
5. Conduit shall be supported in accordance with the NEC and Division 26 Section "Hangers and Supports for Electrical Systems."

N. Provide conduit expansion couplings where conduits cross building or structure expansion joints.

O. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200 pound (90 kg) tensile strength. Label and leave at least 12 inches of slack at each end of pull wire.

P. LTFMC Installation:
   1. Provide separate grounding conductor.
   2. Connection to light fixtures shall not exceed 6 feet in length within an accessible ceiling and 3 feet in length where exposed. Connection to solenoids, pressure switches, motors, fans, HVAC equipment, and similar equipment shall not exceed 3 feet in length.
   3. Flexible conduit shall not be used to connect to surface mounted light fixtures or other non-moving, non-vibrating, or non-adjustable equipment.

Q. PVC Coated RMC Installation:
   1. Installers shall be trained and certified by Manufacturer to install PVC Coated RMC.
   2. Install in accordance with Manufacturer's published installation guide, National Electrical Code, local codes and standard trade practices.
   3. Use Manufacturer's recommended pipe wrenches, clamping devices, benders, and threading tools.
   4. Provide PVC coated fittings at each termination point.
   5. Field threads shall be degreased and coated with Manufacturer's recommended compounds.
   6. Provide separate grounding conductor.
   7. Take care not to damage PVC coating during assembly, cutting, bending, clamping, and threading.
   8. Use Manufacturer's approved touch-up compound to repair nicks and cuts to the outer PVC jacket, and for use as a sealant. Where large abrasions are made in the outer PVC jacket the conduit shall be replaced.

R. Rigid Nonmetallic Conduit Installation:
   1. Provide separate grounding conductor.
   2. Support conduit in accordance with the NEC.
   3. Provide expansion couplings where length change due to temperature variation exceeds 1/4-inch.
   4. When penetrating concrete surfaces or grade, make a transition to rigid steel conduit 6 inches (minimum) below the surface. Provide corrosion protection by coating the RMC with a bituminous coating from inside the encasing material to 4 inches of exposed conduit; vinyl corrosion protection tape may be installed but must be reviewed with the Engineer prior to installation.
   5. Provide rigid steel elbows in all conduit that is underground or encased in concrete.
   6. Where RNMC is embedded in concrete, conduit shall be securely fastened and supported in accordance with the NEC to prevent damage during concrete pours.

S. Firestopping: Firestop all conduit penetrations of fire rated barriers by using approved material to ensure integrity of the rating,

T. Underground Installation:
   1. As indicated on the Drawings, including the excavating, pumping, backfilling, shoring and removal of surplus excavated material.
   2. Underground Obstructions:
      a. Locate all that may interfere with excavation.
      b. Be responsible for damage to existing underground systems and assume all cost of repairing the same.
   3. Backfilling:
      a. Use only clean sand thoroughly compacted to prevent settling of trenched areas.
      b. In the event that backfilled areas do settle, fill and compact to finish grade, and repair all damage caused by settling.
   4. Repair all disturbed surface to match existing.
   5. Unless otherwise indicated on the Drawings, install top of conduit 30 inches below grade when located outside the walls of the building
   6. Provide warning ribbon with tracer wire 6 inches above conduits.

U. Embedment in Concrete:
   1. Where conduit is embedded in concrete, follow the requirements of Section 6.3 in ACI 318 – Building Code Requirements for Structural Concrete and Section 6.3 in ACI 350R – Environmental Engineering Concrete Structures.
   2. Review proposed routing of embedded conduit with Engineer prior to installation.
   3. Embedded conduit shall be installed between top and bottom reinforcement, in a manner that prevents concrete from entering the conduit system.

3.2 CONDUIT SCHEDULE

A. Where information on Drawings conflict with information herein, the more stringent requirements take precedence and the better quality or greater quantity of work shall be provided.

B. Feeders, Branch Circuits and System Conduits:
   1. Underground and In or Below Concrete: RMC or RNMC.
   2. Above Slab or Grade:
      a. Exposed Conduit: RMC.
      b. Corrosive Locations: PVC coated RMC.
      c. Wet Locations: RMC.
   3. Underground Duct Banks:
      a. Encased In Concrete: EB or RNMC.
      b. Not Encased In Concrete: RNMC.

C. Data/communications conduits in dry locations not subject to physical damage and not installed underground nor in or below concrete: RMC; except for PVC coated RMC in Corrosive Locations.
   1. Data/communication conduits shall be bonded.
   2. Data/communication sleeves, provide plastic bushings.
   3. Data/communication conduits shall be 3/4-inch minimum.

D. Lighting Fixture Support: RMC; except for PVC coated RMC in Corrosive Locations.
   1. Where explosion-proof light fixtures are supported via conduit, provide fittings that allow for changing of lamps.
   2. Light fixtures shall not be supported via standard locknuts at the fixture connection. Provide fittings with set-screw or other means to prevent loosening.
   3. Hands-free swivel type hangers shall be used in dry locations. Threaded condulet fittings shall be used in Damp, Wet, and Corrosive Locations.

E. Connection To Equipment:
   1. Lighting Fixtures and Control Devices (including, but not necessarily limited to solenoids, pressure switches, and field instruments):
      a. Dry Locations: LTFMC.
      b. Wet or Damp Locations: LTFMC.
      c. Corrosive Locations: LTFMC with nonmetallic fittings.
   2. Vibrating Equipment (including, but not necessarily limited to motors and transformers):
      a. Motors:
         1) Dry Locations: LTFMC.
         2) Wet or Damp Locations: LTFMC.
         3) Corrosive Locations: LTFMC with nonmetallic fittings.
      b. Transformers:
         1) Dry Locations: LTFMC.
         2) Wet or Damp Locations: LTFMC.
      c. Equipment Mounted On Vibration Isolators:
         1) Dry Locations: LTFMC.
         2) Wet or Damp Locations: LTFMC.

F. Provide separate raceway systems for:
   1. Normal power wiring.
   2. Emergency power wiring.
   3. Data/communication wiring.
   4. Fire alarm system wiring.
   5. A.C. signal and control wiring.
   6. Low voltage signal and control wiring.
   7. Analog instrumentation wiring.
   8. Special systems wiring.

G. Do not utilize panelboards, motor control centers, distribution equipment or like devices as raceways.

H. For conduits that enter NEMA Type 2, 3, 3R, 4, 4X, and 12 enclosures, provide conduit hubs with o-ring gaskets. Hubs shall be suitable for the environment served and shall match the conduit type. Grounding hubs shall be used with nonmetallic enclosures.

I. In chemical containment areas and other areas with special chemical-resistant coatings, conduit and all other electrical equipment shall be installed above/outside containment (coated) area. Do not penetrate floors or walls of containment areas. Conduits shall not be embedded in walls or floors of containment areas.

END OF SECTION 26 05 34

SECTION 26 05 53 – IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the furnishing and installation of proper identification for electrical system components.

B. Items requiring identification or labeling include:
   1. Cables and conductors.
   2. Conduit systems.
   3. Controls:
      a. Motor starters.
      b. Variable frequency drives.
   4. Distribution Equipment:
      a. Disconnect switches.
      b. Transformers.
      c. Panelboards.

1.3 SUBMITTALS

A. Nameplate schedule identifying each device to be labeled and project specific label text.

PART 2 - PRODUCTS

2.1 ELECTRICAL LABELS

A. Provide engraved laminated plastic nameplate to identify each piece of electrical equipment:
   1. Nameplate shall have 3/8-inch minimum black letters on a white background.
   2. Punched or drilled for mechanical fasteners.

B. Provide printed labels by Brady or T&B to identify conductors."

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:
   1. Attach nameplates directly to each piece of electrical equipment.
   2. Where several conductors pass through a pull box, junction box, or enclosure, provide wire labels. Group wires before labeling.

B. Cables and Conductors:
   1. Cables and conductors shall be color-coded in accordance with Division 26 Section “Conductors and Cables – 600V and Below.”
   2. All conductors and cables for power, lighting, control, supervision, low voltage systems, etc. shall be labeled with the source and circuit number and/or match the identification provided in the manufacturer’s submittals and O&M manuals. If none of the identifiers are suitable or available, the Contractor shall devise a clear and understandable identification labeling system. Without exception, all cables and conductors shall be clearly labeled. See detail on the Drawings.
   3. Labeling shall occur everywhere cables and conductors are terminated or spliced.

C. Conduit Systems:
   1. Provide label inside each junction and pull box identifying circuit numbers for all conductors contained inside the box. Labeling shall be printed neatly with permanent, waterproof, black ink marker.
   2. Provide raceway tags on all raceways. See detail on the Drawings.

D. Controls: For each of the following control devices, provide label attached to enclosure cover. Label shall identify:
   1. Motor Starters: Name of equipment served and load (example, “EF-5, 5 HP”).
   2. Variable Frequency Drives: Name of equipment served and load (example, “P-1, 25 HP”).

E. Distribution Equipment: For each of the following pieces of electrical distribution equipment, provide label attached to enclosure cover. See detail on the Drawings. Label shall identify:
   1. Disconnect Switches: Name of equipment served, number of poles, ampere rating/fuse size (where applicable), and load (example, “RTU-1, 3P30/25, 8 TON”).
   2. Enclosed Circuit Breakers: Name of device as indicated on one line diagram, number of poles, and circuit breaker size (example, “MCB, 3P200”).
   3. Transformers: Name of electrical equipment as indicated on one line diagram, KVA rating, primary voltage: secondary voltage, source transformer is fed from, and load transformer feeds (example, “T-LPA, 45 KVA, 480:208Y/120V, FED FROM MSWBD, FEEDS PANEL LPA”).
   4. Panelboards:
      a. Name of electrical equipment as indicated on one line diagram, voltage-phase, and source panelboard is fed from (examples, “LPA, 208Y/120V-3Ø-4 WIRE, FED FROM T-LPA”; “DPA, 480Y/277V-3Ø-4 WIRE, FED FROM MSWBD”).
      b. Equip interior of enclosure door with a circuit directory frame, typewritten card, and clear plastic cover. Directory shall identify load description for each circuit, including spares. Hand lettering is not acceptable.

END OF SECTION 26 05 53

SECTION 26 29 23 – VARIABLE FREQUENCY MOTOR CONTROLLERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections apply to this Section.

1.2 SUMMARY

A. This Section includes the furnishing and installation of variable frequency drives (VFDs).

B. VFDs shall be complete packed systems, engineered to meet the requirements indicated herein and on the Drawings.

C. Reference the Drawings for additional information related to VFDs.

1.3 REFERENCES

A. Except as herein specified or as indicated on the Drawings, the work of this Section shall comply with the following:
   1. ANSI/IEEE Standards:
      a. C62.41.1 – Guide on the Surge Environment in Low-Voltage (1000 V and less) AC Power Circuits.
      b. C62.41.2 – Recommended Practice on characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits.
      c. C62.45 – Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1000 V and Less) AC Power Circuits.
      d. 519-2014 – Recommended Practice and Requirements for Harmonic Control in Electric Power Systems.
   2. NECA Standards: 402 – Recommended Practice for Installing and Maintaining Motor Control Centers.
   3. NEMA Standards:
      a. AB 1 – Molded-Case Circuit Breakers, Molded Case Switches, and Circuit-Breaker Enclosures.
      b. AB 3 – Molded Case Circuit Breakers and Their Application.
      c. ICS 2 – Industrial Control and Systems: Controllers, Contactors, and Overload Relays Rated 600 Volts.
      d. ICS 7 – Adjustable-Speed Drives.
      e. ICS 7.1 – Safety Standards For Construction And Guide For Selection, Installation, And Operation Of Adjustable-Speed Drive Systems.
   4. ANSI/NETA Standards:
      a. ATS – Acceptance Testing Specifications for Electrical Power Equipment and Systems.
   5. NFPA Standards:
      a. 70 – National Electrical Code.
      b. 70E – Standard for Electrical Safety in the Workplace.
   6. Underwriters Laboratory (UL) Standards:
      a. 489 – Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures.
      b. 508 – Standard for Industrial Control Equipment.
      c. 508C – Power Conversion Equipment.
      d. 845 – Motor Control Centers.
      e. 1449 – Transient Voltage Surge Suppressors.

1.4 SUBMITTALS

A. Shop Drawings: For VFDs.
   1. Name of Manufacturer.
   2. Model number.
   3. Details of construction and installation.

4. Assembly drawings, including elevations, plans, sections, dimensions, weight, and conduit entry locations.
5. Project Specific Wiring Diagrams:
   a. Diagrams shall clearly identify all field wiring requirements.
   b. Typical diagrams are acceptable for multiple motors controlled in the same manner.
6. Electrical Ratings:
   a. Voltage.
   b. Horsepower.
   c. Interrupt rating.
   d. Enclosure type.
7. Color and finish.
8. Options and accessories.
9. Warranty statement.

B. Installation Instructions: For VFDs.

C. Manufacturer's startup reports to be submitted within 48 hours of completion of startup.

D. Test reports to be submitted within 48 hours of completion of testing.

E. Manufacturer's Certification of VFDs: Written approval of installation upon completion.

F. Operation and Maintenance Manuals: For VFDs.
1. Equipment function, normal operating characteristics, and limiting conditions.
2. Assembly, installation, alignment, adjustment, and checking instructions.
3. Operating instructions for startup, routine and normal operating, regulation and control, shutdown, and emergency conditions.
4. Maintenance instructions.
5. Guide to "troubleshooting".
6. Parts lists and predicted life of parts subject to wear.
7. Project specific outline and cross sections, assembly drawings, engineering data, and wiring diagrams. Wiring diagrams shall reflect final, as-installed conditions, and include wire numbers.
8. Test data and performance curves.
9. Manufacturer's startup reports.
10. Test reports.
11. Warranty statement including dates of coverage.
12. Electronic copies of all equipment documentation (i.e., installation instructions, maintenance instruction, project specific wiring diagrams, project specific configuration parameters, etc.) shall be submitted on USB flash drive. Electronic files shall be Acrobat Reader (.PDF) files or AutoCAD (.DWG) files.
13. Configuration Parameters: Provide list of all configurable parameters. Indicate which parameters were changed from default values.

1.5 QUALITY ASSURANCE

A. Fabrication and Installation Personnel Qualifications:
1. Trained and experienced in the fabrication and installation of the materials and equipment.
2. Knowledgeable of the design and the reviewed submittals.

B. VFD Supplier: Provide factory authorized service center within 100 miles of the installation Site.

C. Manufacturer's Services:
1. Provide Manufacturer's field startup service.

D. All VFD assemblies shall be listed and labeled by UL or ETL for compliance with UL 508.

1.6 DELIVERY, STORAGE AND HANDLING

A. Delivered materials in original, unbroken, brand marked containers or wrapping as applicable.

B. Handle and store materials in a manner which will prevent deterioration or damage, contamination with foreign matter, damage by weather or elements, and in accordance with Manufacturer's directions.

C. Store materials indoors and protect from weather. When necessary to store outdoors, elevate materials above grade and enclose with durable, watertight wrapping.

D. Reject damaged, deteriorated, or contaminated materials and immediately remove from the Site. Replace rejected materials with new materials at no additional cost to Owner.

1.7 DESCRIPTION OF CONTROL FUNCTIONALITY

A. Operator Controls:
   1. Hand-Off-Auto (HOA):
      a. Selector switch positions shall be monitored as indicated on VFD wiring diagrams. HOA shall have precedence over local operator interface (OI) controls.
      b. When HOA “Off” mode is selected, VFD shall not operate via SCADA or OI control.
      c. When HOA “Hand” mode is selected, Start/Stop control shall be “Start” and “Stop” pushbuttons located at the VFD. Speed control shall be via the OI control and shall over-ride control signals from SCADA. SCADA shall not have any control over VFD.
      d. When HOA “Auto” mode is selected, SCADA system shall operate the VFD and the VFD shall operate until the “Off” mode is selected. Speed setpoint shall be initially set at a pre-programmed speed (adjustable from 70-100%), and VFD shall not respond to OI initiated control.

B. Reset button shall function only when drive is in “Faulted” status to clear all drive faults and return drive to service, to be controlled as described above.

C. Upon powering up the drive, the VFD speed (Hz) shall be displayed by default with no OI button selection being required. Where this functionality cannot be accomplished via the OI, a display (0-60 Hz) shall be provided on face of VFD enclosure.

PART 2 - PRODUCTS

2.1 VARIABLE FREQUENCY DRIVES (VFDs)

A. Manufacturers: All VFDs shall be by the same manufacturer.
   1. Eaton/Cutler-Hammer Corporation.
   2. General Electric/ABB Company.
   3. Rockwell Automation; Allen Bradley.
   4. Schneider Electric; Square D Products.
   5. Siemens Energy & Automation, Inc.

B. General:
   1. VFDs shall be rated for 480 VAC operation and shall provide microprocessor-based control of 3-phase motors. VFDs shall be capable of operating any NEMA Design B squirrel cage induction motor, regardless of manufacturer. VFDs shall be rated for variable torque applications.
   2. VFDs shall utilize pulse width modulation (PWM) technology, converting input voltage and frequency to a variable voltage and frequency output via a 2-step operation. Insulated gate bipolar transistors (IGBTs) shall be used in the inverter section.
      a. The rectifier stage shall convert fixed voltage, fixed frequency, AC line power to a fixed DC voltage. The rectifier shall be insensitive to phase rotation of the AC line. The DC voltage shall be filtered.
      b. The inverter shall change the fixed DC voltage to a variable frequency AC output.
   3. VFD output, actuation, and braking shall be sequenced and coordinated to provide smooth starting and stopping.
   4. Each VFD shall be able to start into a spinning motor by being able to determine motor speed, in any direction, and resume operation without tripping. If the motor is spinning in the reverse direction, the VFD shall start into the motor in the reverse direction, bring the motor to a controlled stop, and accelerate the motor to the required speed. VFDs shall be capable of being run without a connected load.
   5. Separate supply side and load side lugs and terminal blocks shall be provided for power and control wiring connections.

C. Operating Conditions:
   1. Incoming Power: 480 VAC, 3-phase, ± 10%; 60 Hz, ± 5 Hz.
   2. Frequency Stability: ± 0.05% with voltage regulation of ± 1% of maximum rated output voltage.
   3. Speed Regulation: ± 0.5% of base speed.
   4. Load inertia dependent carryover (ride-through) during utility loss. Each VFD shall have a minimum power loss ride-through of 5 cycles.
   5. Insensitive to input phase rotation.
   6. Humidity: 0 to 95%, non-condensing and non-corrosive.
   7. Altitude: 0 to 3,300 feet above sea level.
   8. Ambient Temperature: 0 to 40 degrees C.
   9. Storage Temperature: -40 to 60 degrees C.
   10. To ensure adequate heat dissipation, fan assisted cooling or circulation may be provided such that it does not degrade the enclosure rating.

D. VFD Ratings:
   1. Full load output current rating shall be based on 40 degrees C ambient and 10 kHz switching frequency below 40 HP and 3.6 kHz, 40 HP and above. Upon sensing an over-temperature, VFD shall fold-back switching frequency to reduce operating temperature. VFD shall return to the rated switching frequency after the over-temperature condition has passed.
   2. Each VFD shall have an efficiency that exceeds 95% for loads below 15 HP and exceeds 97% for loads 15 HP and above. Efficiency shall exceed 90% at 50% speed and load.
   3. Each VFD shall maintain a line side displacement power factor at no less than 0.95, regardless of speed and load.
   4. VFD shall have a 1-minute overload current rating at 120% for variable torque applications; 150% for constant torque applications.
   5. Each drive shall be able to provide rated motor torque at 0.5 Hz.
   6. Each VFD and its components shall be housed in a Motor Control Center or NEMA 12 enclosure, as indicated otherwise on the Drawings.
   7. Output frequency of each drive shall be adjustable from 0-400 Hz.
   8. Each VFD shall include automatic slip compensation.
   9. Each VFD shall be rated for 42K AIC (minimum).

E. Protection:
   1. Each VFD shall include protection against short circuits between output phases, between output phases and ground, on the output, on the internal supplies, and on the logic and analog outputs.
   2. Each VFD shall have an auto restart function which will provide up to 5 restart attempts on a fault condition other than a ground fault, short circuit, or internal fault. A programmable time delay before restart attempt from 1 to 600 seconds shall be included.
   3. Deceleration shall be programmable for normal and fault conditions.
   4. Upon loss of analog input, the VFD shall indicate a fault and be capable of being programmed to operate at a user defined speed.
   5. Solid state I^2t protection shall be included that is adjustable from 45 to 105% of the current output of the drive. The protection shall be UL listed and meet UL 508C as Class 10/20 overload protection.
   6. Each VFD shall have a thermal switch with an adjustable prealarm that will provide a minimum of a 60 second delay before an over temperature fault.
   7. Each VFD shall include a programmable fold-back function that will anticipate controller over temperature and/or overload conditions and fold back the output frequency to avoid fault conditions.
   8. The internal power supply shall include protection from incorrect connection and shorting. Logic outputs shall be current limited and shall not be damaged from shorting or excess current draw.
   9. Each VFD shall include the following protective features:
      a. Overcurrent.
      b. Overvoltage.
      c. Phase rotation insensitive.
      d. Input phase loss.
      e. Input overvoltage.
      f. Line surge.
      g. Output short circuit.
      h. Output ground fault.
      i. Output phase loss.
      j. Over-temperature.
      k. DC overvoltage.

l. Drive overload.
m. Motor overload.
n. Motor underload.
o. Inverter fault.
p. Motor high winding temperature (temperature switch(es) wired to VFD as a discrete input).
q. Selectable automatic restart after power loss or on resettable trip.
r. Stall protection (0% to 200%, 2 to 120 seconds).
s. Microprocessor failure.

10. Each VFD shall provide ground fault protection during power-up, starting, and running.
11. Each VFD shall include internal diagnostics for valid operation of memory, option module, loss of analog input, communications loss, dynamic brake failure, power supply failure, and loss of control power. VFD run status and fault types shall be recorded in each drive's memory for the past 9 faults (minimum). On a fault, the VFD shall shut down without damage to itself or other non-faulted equipment.
12. Each drive shall provide Class 10/20 overload protection.
13. Each VFD shall be provided with a conformal coating applied to all sensitive electrical components.

F. Adjustments and Configurations:
1. Three types of acceleration and deceleration ramps shall be available to be programmed into the VFD: linear, S curve and U curve. Acceleration and deceleration ramp times shall be adjustable from 0.1 to 3,000 seconds.
a. VFDs shall include two-part ramps for starting (acceleration) and stopping (deceleration). For starting, VFD shall be able to ramp quickly from 0 to an operator adjustable speed or percentage, then ramp from that speed to the desired operating speed in an operator adjustable time period. For stopping, VFD shall ramp from operating speed to an operator adjustable speed or percentage in an operator adjustable time period, then ramp quickly from that speed to 0.
2. Each VFD shall be able to be programmed for open loop sensorless vector or V/Hz frequency control mode.
3. The volts per frequency (V/Hz) ratios shall be user selectable to meet various torque applications. The V/Hz output shall not be affected or require readjustment when other drive adjustments (such as maximum speed) are changed.
4. For variable torque applications, the VFD shall include a no-load function that allows the voltage to the motor to be reduced. A constant V/Hz will be maintained during acceleration. The output voltage will then automatically adjust to meet the torque requirements of the load.
5. Each VFD shall include slip compensation.
6. Three skip frequency ranges (for critical frequency avoidance) shall be provided with selectable 2 or 5 Hz bandwidths. The skip frequencies shall be able to be programmed independently, back to back or overlapping.

G. Operator Interface:
1. A door mounted operator interface (OI) panel shall be included with each VFD. The panel shall be an alphanumeric, LCD display panel with a terminal keypad and status indicators. From the panel, an operator shall be able to view and/or adjust all configuration, programming, diagnostic, and operating parameters and I/O assignments. Access to configuration parameters shall be protected to prevent unauthorized adjustments. Operator interface panel shall be accessible without having to open the enclosure.
2. Each VFD shall include indicator for VFD power ON and other conditions as specified herein.

H. Control:
1. Each VFD shall be capable of interfacing with external pilot devices for starting/stopping, speed control, and operational status.
2. Control power shall be supplied from an internal power supply (120VAC or 24VDC). Power supply shall be sized to supply power to auxiliary devices as required. Interposing relays shall be provided as required to be compatible with signal wiring. Coordinate signal voltages with existing field devices interfacing with VFD.
3. Each VFD shall include a minimum of 5 programmable digital inputs, 2 analog inputs (operator selectable for 0-20 mA, 4-20 mA, 20-4 mA, 0-5 V, 1-5 V, or 0-10 V), 3 programmable relay (Form C) outputs, and 2 analog outputs (operator selectable for 0-20 mA, 4-20 mA, 20-4 mA, 0-5 V, 1-5 V, or 0-10 V). The analog outputs shall be able to be programmed to be proportional to frequency, current, power, torque, or voltage. Additional I/O shall be provided as required to achieve functionality as indicated on drawings and described herein.

4. Refer to wiring diagrams for specific control device requirements. Equipment Suppliers are responsible for coordinating control devices required by respective equipment.
5. The following door mounted devices shall be provided:
    a. Hand-Off-Auto maintained position, 22.5 mm selector switch, equal to Allen-Bradley 800MR. Auxiliary contact on the Hand-Off-Auto selector switch to provide indication that the switch is in the Auto position.
    b. Start and stop pushbuttons momentary position, 22.5 mm pushbuttons, equal to Allen-Bradley 800MR, for operating VFD in Hand position as indicated on the Drawings.
    c. Elapsed time indicator, synchronous motor type, 5/32-inch minimum display size.
    d. Push-to-Test, 22.5mm, LED type, red RUNNING indicating light, equal to Allen-Bradley 800MR.
    e. Push-to-Test, 22.5, LED type, amber VFD FAULT indicating light, equal to Allen-Bradley 800MR.
    f. Reset pushbutton, equal to Allen-Bradley 800MR.
    g. Speed indication meter, where required to meet functional requirements.
    h. Speed potentiometer, where required to meet functional requirements.
6. Door mounted devices shall be mounted between 40 inches and 60 inches above finished floor or grade.

I. Accessories:
1. Circuit breaker disconnect to disconnect all incoming AC power. Handle position shall indicate ON, OFF, and TRIPPED conditions. Disconnect shall be interlocked to prevent unauthorized opening/closing of the VFD door with the handle in the ON position. Interlock shall be defeatable. Disconnect shall be lockable.
2. Ethernet/IP Ethernet Communication Module. Coordinate communication module with SCADA system architecture and system component manufacturers.
3. Provide circulating fan(s) of size and quantity as required. Fans shall be thermostatically or otherwise controlled and have a delayed off time feature (set to turn fan(s) off 20 minutes after VFD shuts down). Fans shall not run constantly.
4. Heavy duty, industrial control relays with tubular pin terminal, pure silver contacts, and IP20 sockets, quantity as required.
5. Contactors (for VFD and Bypass operation): NEMA rated, magnetically held, field replaceable coil and contacts, auxiliary contacts field installable and removable. Terminal temperature rise is not to exceed 50 degrees C in accordance with NEMA standards.

J. Warranty: Manufacturer shall provide a comprehensive, on-site product warranty, including parts, labor and travel expenses, for a period of not less than 3 years from date of installation

2.2 HARMONIC DISTORTION MITIGATION

A. VFDs shall limit harmonic distortion reflected onto the power distribution system to the voltage and current levels defined by IEEE 519.

B. VFDs shall utilize 6-pulse technology with an active front end low harmonic filter.

C. Provide a 5% input line reactor (minimum) with each VFD.

2.3 SPARE PARTS

A. 1 set of fuses for each size and type provided.

B. 1 set of MOVs.

C. 1 set of fan(s).

D. 2 sets of control power fuses for each size and type provided.

E. 2 pilot lights of each type provided.

F. 1 keypad for each type provided.

G. 2 sets of filters (for fans/ventilation).

2.4 SHAFT GROUNDING RINGS (SGRs) AND HIGH FREQUENCY BONDING

A. All motors operated on variable frequency drives shall be equipped with a maintenance-free, conductive microfiber shaft grounding ring to meet NEMA MG-1, 3.4.4.4.3 requirements, with a minimum of two rows of circumferential microfibers to discharge damaging shaft voltages away from the bearings to ground. SGR's Service Life: Designed to last for service life of motor. Provide AEGIS SGR Conductive MicroFiber Shaft Grounding Ring, or approved equal.

B. Motors up to 100 HP shall be provided with one shaft grounding ring installed on either the drive end or non-drive end. Motors over 100 HP shall be provided with an insulated bearing on the non-drive end and a shaft grounding ring on the drive end of the motor with the exception of line contact bearings in the drive end of the machine. In this instance the line contact bearing must be electrically insulated, and the AEGIS Bearing Protection Ring installed on the opposite drive end of the motor. Grounding rings shall be provided and installed by the motor manufacturer or contractor and shall be installed in accordance with the shaft grounding ring manufacturer's recommendations.

C. All motors operated on variable frequency drives shall be bonded from the motor foot to system ground with a high-frequency ground strap made of flat braided, tinned copper with terminations to accommodate motor foot and system ground connection. Provide AEGIS HF Ground Straps, or equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install all required motor overloads sized in accordance with motor nameplate FLA.

B. Locate VFD as indicated on the Drawings.

C. Ensure unrestricted access to ventilation for VFD.

D. Separate line, load, and control conductors per the Manufacturer's instructions (in separate conduits).

E. Reference Manufacturer's literature for any special grounding requirements.

3.2 SHAFT GROUNDING RINGS

A. Shaft grounding rings (SGR) shall be factory installed inside the motors by the manufacturer wherever possible. SGRs may be field installed by installing contractor subject to Engineer's approval. Provide AEGIS SGR Colloidal Silver Shaft Coating, or approved equal, on shafts prior to rings installation, in accordance with SGR manufacturer's recommendations, after first cleaning shafts.

B. Install and test SGRs in accordance with manufacturer's recommendations. Install the SGR so that the aluminum frame maintains an even clearance around the shaft. Conductive microfibers shall be in full circumferential contact with conductive metal surface of the shaft. Do not use thread lock to secure the mounting screws as it may compromise the conductive path to ground. If thread lock is required, use a small amount of EP2400 AEGIS Conductive Epoxy, or approved equal, to secure the screws in place.

C. Shafts shall be clean and free of any coatings, paint, or other nonconductive material (clean to bare metal). Depending upon the condition of the shaft, it may require using emery cloth or Scotch-Brite. If the shaft is visibly clean, a non-petroleum-based solvent may be used to remove any residue. Check the conductivity of the shaft using an ohm meter. Ohms test: Place the positive and negative meter leads on the shaft at a place where the microfibers will contact the shaft. Each motor will have a different reading but in general one should have a maximum reading of less than 2 ohms. If the reading is higher, clean the shaft again and retest.

D. After motors with SGR are fully installed in the field (in equipment, assemblies, or individually), for both factory-installed-SGR and field-installed-SGR cases, test for a conductive path to ground using an Ohm meter. Place one probe on metal frame of SGR and one probe on motor frame. Motor must be grounded to common earth ground with variable frequency drive according to applicable standards. Verify that SGR installations and test readings comply with SGR manufacturer's requirements.

3.3 HIGH-FREQUENCY BONDING

A. All motors operated on variable frequency drives shall be bonded from the motor foot to system ground with a high-frequency ground strap made of flat braided, tinned copper with terminations to accommodate motor foot and system ground connection. Provide AEGIS HF Ground Straps, or equal. After motors with SGR are fully installed in the field (in equipment, assemblies, or individually), for both factory-installed-SGR and field-installed-SGR cases, test for a conductive path to ground using an Ohm meter.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Arrange and pay for Manufacturer's engineer to provide the services indicated below for a minimum onsite time of 1 day, or as needed to completely startup and commission all VFDs in accordance with the Manufacturer's instructions. Provide individual startup and testing reports for each VFD. Schedule the following as soon as practicable after installation and at times approved by Engineer and Owner.
   1. Manufacturer's Engineer:
      a. Check work.
      b. Configure, program, and commission VFDs. Coordinate with startup schedule of related equipment.
      c. Assist in startup and modify configuration parameters as required to coordinate equipment operation with SCADA controls.
      d. Demonstrate operation and maintenance to Owner's personnel.
      e. Review operation and maintenance manual with Owner's personnel. Two 2-hour review sessions shall be scheduled to coordinate with schedules of Owner's personnel (i.e., day/morning and afternoon/evening shifts). Each review session shall accommodate up to 8 individuals. Submit detailed outline for each review session prior to scheduling. Owner reserves the right to record review sessions. Recording will be done by Owner.
      f. Adjust device configuration parameters as required. All drive parameters shall be documented and included in the operations and maintenance manuals and startup reports.
      g. Revisit each site 3 months after startup of variable frequency drives to confirm operation, adjust parameters, and answer questions from Owner. Document all changes/adjustments and submit visitation report for record.

B. Promptly make all changes and additions required by Manufacturer's engineer.

C. Submit Manufacturer's engineer's written approval of installation.

D. Infrared Scanning: Prior to Substantial Completion, perform an infrared scan of all variable frequency motor controllers and conductor connections.
   1. Use an infrared-scanning device designed to measure temperature or detect significant deviations from normal values. Provide documentation of device calibration.
   2. Perform a follow-up infrared scan of variable frequency drives at 11 months after Substantial Completion.
   3. Prepare a certified report identifying variable frequency drive checked and describing results of scanning. Include notation of deficiencies detected, remedial action taken, and scanning observations after remedial action.

END OF SECTION 26 29 23

SECTION 31 10 13 – SITE PREPARATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the major items listed below:
   1. Clearing Site of above-grade trees, shrubs, grass and plant life.
   2. Removal of the following man-made items:
      a. Walls.
      b. Fences.
      c. Sheds.
      d. Similar improvements as indicated on the Drawings.
   3. Removal of roots and stumps.
   4. Removal of exposed rocks, boulders and debris.

1.3 REFERENCES

A. Except as herein specified or as indicated on the Drawings, the Work of this Section shall comply with the following:
   1. State DOT Current Standards:
      a. Specifications for Construction.
      b. Standard Plans.

1.4 DEFINITIONS

A. Terms: Surface Improvements: Pavement, walks, drives, curbs, curb and gutter, improved lawns, monuments, property irons, reference points and similar improvements.

1.5 SUBMITTALS

A. Permit to Store or Dump Removed Materials:
   1. On property owned, leased or occupied by someone other than Owner.
   2. Submit prior to storing or dumping.
   3. Permit shall absolve Owner from responsibility for storing or dumping.

1.6 QUALITY ASSURANCE

A. Trimming: Trimming of limbs and branches and the painting of tree wounds shall be actively supervised by a member of one of the following:
   1. ASCA - American Society of Consulting Arborists.
   2. ISA - International Society of Arboriculture.
   3. NAA - National Arborist Associations.

B. Interference:
   1. Ensure that Site preparation work does not unduly interfere with pedestrian and vehicular traffic.
   2. Obtain Engineer's and governing authority's approvals prior to closing a public street.

1.7 PROJECT CONDITIONS

A. Burning: Not permitted.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.1 PREPARATION

A. Soil Erosion Control: Provide soil erosion control in accordance with Division 31 Section “Erosion and Sedimentation Controls” prior to starting Site preparation work.

B. Protection of Trees and Shrubs:
   1. Protect trees and shrubs which are to remain from permanent damage by construction operations.
   2. Prevent vehicles from driving within area under dripline of trees which are to remain.

C. Maintain designated temporary roadways, walkways, and detours for vehicular and pedestrian traffic.

3.2 APPLICATION

A. Clearing:
   1. Remove items requiring removal under this Section from area indicated on Drawings.
   2. Remove roots rocks and boulders to a depth of 2 feet below finish grade in the following areas:
      a. Proposed buildings or structures.
      b. Proposed pavements and walks.
      c. Other areas where compaction of the subgrade is required.

B. Removal of Sod: Cut to a straight line at the expected excavation limits with sod cutter.

C. Prevent Construction Operations from Damaging or Disturbing:
   1. Trees or roots of trees which are to remain.
   2. Surface improvements which are to remain.

3.3 DISPOSAL OF EXCESS MATERIAL

A. General:
   1. Remove and properly dispose of all material not needed to complete Project.
   2. Dispose of excess material at a location off the Site.
   3. Dispose of excess topsoil at a location off the Site.
   4. Disposal of materials shall not violate laws, rules, regulations and the like regarding the filling of flood plains, wetlands and other environmentally sensitive areas.
   5. Provide adequate controls to maintain disposal sites in a neat and safe conditions by periodic leveling of material, the control of erosion and such other practices as are necessary.

END OF SECTION 31 10 13

SECTION 31 22 00 – GRADING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the furnishing and installation of the major items listed below:
   1. Excavation.
   2. Cutting and filling.
   3. Rough and finish grading.
   4. Disposal of excavated materials.
   5. Topsoil.
   6. Excess water control.
   7. Pavement subgrade.

1.3 REFERENCES

A. Except as herein specified or as indicated on the Drawings, the work of this Section shall comply with the following:
   1. AOAC - Association of Official Agricultural Chemists: Methods of Testing.
   2. ASTM Standards:
      a. D422 - Method for Particle-Size Analysis of Soils.
      b. D698 - Laboratory Compaction Characteristics of Soil Using Standard Effort.
      c. D1557 - Laboratory Compaction Characteristics of Soil Using Modified Effort.
      d. D2487 - Classification of Soils for Engineering Purposes.
   3. State DOT Current Standards:
      a. Specifications for Construction.
      b. Standard Plans.

1.4 DEFINITIONS

A. Terms:
   1. Driving Surface: A pavement, curb, or sidewalk.
   2. Excavation:
      a. Removing the following materials from their present location:
         1) Native below-grade material such as soil, rocks, boulders less than 1/2 cubic yard in volume, and buried trees.
         2) Man-made items such as, but not necessarily limited to:
            a) Bituminous and concrete paving.
            b) Curbs.
            c) Riprap.
            d) Head walls.
            e) Underground utilities.
            f) Manholes and catch basins.
            g) Foundations.
            h) Sidewalks.
   3. Fill: Soil, native material, imported material or other material which is placed over the subgrade, or excavated areas; under roadways, parking areas, walks, buildings, or structures; and anywhere else on the Site.
   4. Grading: The act of moving soil from one location on the Site to another to achieve the contours and elevations as indicated on the Drawings and as herein specified.
   5. Hardpan:
      a. Cemented soil layers.
      b. Is not hard clay layers that are not cemented.

6. Imported Material: Soil material which is purchased by Contractor and hauled onto the Site.
7. Native Material: Soil and other natural earth materials, except rock, which are existing on the Site prior to the start of Work.
8. Pavement: Any combination of subbase, base course and concrete, bituminous or aggregate surface course, including shoulders, placed on a subgrade. Includes roadways, parking areas, driveways, and bituminous seal coat.
9. Rock Excavation:
    a. Excavation of igneous, metamorphic or sedimentary rock or hardpan which cannot be excavated without continuous drilling or blasting or continuous use of a ripper or other special equipment.
    b. Excavation of boulders of 1/2 cubic yard or more in volume.
10. Structure: A building, retaining wall, tank, footing, slab, or other similar construction.
11. Subbase: The layer of material placed on the subgrade as part of the pavement structure.
12. Subgrade:
    a. Below structures and below fill on the Site: The top elevation of the undisturbed native material after all topsoil is stripped off and excavation is completed.
    b. Below driving surfaces: The bottom elevation of the subbase.
13. Surface Improvement: All improvements beyond what might be encountered in an open unimproved field.
14. Undercut: Excavation of native material from below the bottom of footings, floors, structures, and subbases.
15. Utility Structure: Manhole, catch basin, valve chamber, junction chamber, water main valve, or other similar utility appurtenance.
16. Other Definitions: Other earthwork terms not defined in the Contract Documents shall be as defined in state DOT Standard Specifications for Construction.

1.5 QUALITY ASSURANCE

A. Testing will be performed in accordance with Division 01 Section “Testing Services for Buried Utilities, Roadways, and Site Projects” and the Contractors Quality Control Plan.

B. Compaction:
1. Predominately Granular Soils:
    a. Density shall be determined by using the modified Proctor method, ASTM D1557.
    b. Compact fill to at least 95% maximum density.
    c. The first 12 inches of subgrade below all driving surfaces, structures, utility structures, and fill on the Site:
        1) Shall be tested for density.
        2) Compact to at least 95% maximum density if the existing density is below 95%.
2. Predominately Cohesive Soils:
    a. Density shall be determined by using the standard Proctor method, ASTM D698.
    b. Compact fill to at least 98% maximum density.
    c. The first 12 inches of subgrade below all driving surfaces, structures, utility structures, and fill on the Site:
        1) Shall be tested for density.
        2) Compact to at least 98% maximum density if the existing density is below 95%.

1.6 PROJECT CONDITIONS

A. Dust Control:
1. Use all legal means necessary to control dust on and near the Work and on and near all off-site borrow areas if such dust is caused by Contractor's operations during performance of the Work or if resulting from the condition of the Site when earthwork operations are suspended.
2. Treat haul roads, delivery roads, temporary site access roads and other surfaces as required to prevent dust from being a nuisance to the public, neighbors, and concurrent performance of other work on the Site.
3. Scrape, broom, or vacuum adjacent streets to remove tracked dirt every Friday afternoon, or more often as necessary if directed by Engineer. Utilize vacuum if dust from brooming is excessive in opinion of Engineer.

B. Existing Structures, Utility Structures, and Utilities:
   1. Call MISS DIG to locate all existing underground utilities prior to starting excavation.
   2. Where utilities, utility structures, or structures are encountered which are in active use:
      a. Provide adequate protection for them.
      b. Be responsible for damages to them.
   3. Provide stand-by utility service if temporary removal is necessary for a period exceeding 2 hours.
   4. Where utility service connections to occupied buildings must be temporarily disconnected, give 48 hours notice to the affected occupants of the time and duration of the anticipated shut off.
   5. Notify Fire Department 48 hours in advance if water main or fire supply line shutoff is required.
   6. Raise, lower, or move underground utilities, utility structures, or structures which interfere with the utility, utility structure, or structure being constructed as part of this Work.

C. Special Filling Requirements:
   1. Comply with the regulations of the state DOT, county road, and railroad company engineering departments with regard to placing fill and compaction in their respective rights-of-way.
   2. Obtain necessary permits for filling activities off Site.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General:
   1. Approval Required: All material shall be subject to the approval of Engineer or independent testing laboratory.
   2. Notification: For approval of imported material, notify Engineer or independent testing laboratory at least 1 week in advance of intention to import material, designate the proposed borrow area, and permit Engineer or independent testing laboratory to sample as necessary from the borrow area for the purpose of making acceptance tests to prove the quality of the material.

B. Material Sources and Uses:
   1. Imported Material:
      a. Fill in undercut.
      b. Fill below structures, utility structures, or driving surfaces.
      c. Stone stabilization course.
      d. Topsoil.
   2. Native material, unless quantity is not sufficient; then shall be imported material.
      a. Fill not below structures, utility structures, or driving surfaces.

C. Fill In Undercut: MDOT 902, Granular Material Class II.

D. Fill below structures, utility structures, or driving surfaces: MDOT 902, Granular Material Class II.

E. Stone Stabilization Course:
   1. Crushed Stone: 1-1/2 inches maximum size.
   2. Filter Fabric:
      a. By Mirafi; Amoco; Exxon; Nicolon; or equal.
      b. Monofilament polypropylene woven fabric.
      c. Equivalent opening size of 70.

F. Fill Not Below Structures, Utility Structures, or Driving Surfaces:
   1. Native material.
   2. Exclusive of gray or blue clay, peat, organic matter, or frozen lumps.
   3. Containing no rocks or lumps over 3 inches in greatest dimension.
   4. Obtain approval for using native material as fill from Engineer or independent testing laboratory.

G. Topsoil:
1. Fertile, friable soil, containing a minimum of 2.5% and maximum 12% of organic matter as determined by the Loss on Ignition Test, AOAC, with not more than 50% clay and not more than 55% sand as determined in accordance with ASTM D422.
2. At least 90% of the material shall pass the No. 10 sieve and shall be free of refuse or all material toxic to plant growth, free of subsoil and stumps, roots, brush, stones or similar objects larger than 1-inch diameter.
3. Ordinary sods and herbaceous growth, like grass, need not be removed, but shall be thoroughly broken up and intermixed with soil during handling operations.
4. Topsoil, unless otherwise specified or approved, shall have, according to Methods of Testing by the AOAC, acidity range of approximately 5.5 pH to 7.6 pH or as approved by Engineer prior to delivery.

2.2 OTHER MATERIALS

A. All other materials, not specifically described but required for proper completion of the work of this Section, shall be as selected by Contractor subject to the approval of Engineer or independent testing laboratory.

PART 3 - EXECUTION

3.1 EXCAVATION

A. Topsoil:
1. Remove all topsoil to depth at which subsoil is encountered, from all areas under buildings, driving surfaces, and from all areas which are to be cut to lower grades or filled.
2. With Engineer's approval, topsoil to be used for finish grading may be stored on the Site.
3. Other topsoil may be used for fill in noncritical areas with approval of Engineer.

B. Obstructions:
1. Remove and dispose of buried trees, rocks, boulders, driving surfaces, pipes and the like, as required for the performance of the Work.
2. Exercise care in excavating around catch basins, inlets, and manholes.
3. Avoid removing or loosening castings or pushing dirt into utility structures.
4. Repair or replace damaged or displaced castings; remove dirt entering utility structures during the performance of the Work at no additional cost to Owner.

C. Cutting Paved Surfaces and Similar Improvements:
1. All cuts shall be a minimum of 1-foot wider than trench on each side. When the remaining width of paved surface is less than 4 feet, remove the entire paved surface.
2. Before removing pavement, mark the pavement neatly, paralleling pipe lines and existing street lines. Space the marks the width of the trench.
3. Concrete:
   a. Pavements: Saw cut if over 3 feet from expansion or construction joint, otherwise remove to joint.
   b. Sidewalks: Remove to joints.
   c. Curb and gutter: Remove to joints.
4. Final surface Course Bituminous: Saw cut joints unless otherwise approved by Engineer.
5. Do not disturb or damage the adjacent pavement. If the adjacent pavement is disturbed or damaged, remove and replace the damaged pavement.
6. Contractor may tunnel under curbs that are encountered. Replace curb disturbed by construction.
7. Dispose of materials removed.

D. Utilities To Be Abandoned:
1. When pipes, conduits, sewers, or other utilities or utility structures are removed from the excavation leaving dead ends in the ground, fully plug such ends with brick and mortar.
2. Entirely remove abandoned utility structures unless otherwise specified or indicated on the Drawings.
3. Remove from the excavation all materials which can be readily salvaged and store at a location designated by Owner
4. All salvageable materials will remain the property of Owner unless otherwise indicated by Owner.

E. Undercut:
   1. If soft material, which in the opinion of Engineer or independent testing laboratory is not suitable, is encountered below a structure, utility structure, or driving surface, Engineer may order the removal of this soft material and its replacement with specified material in order to make a suitable foundation for the construction of the structure, utility structure, or driving surface.
   2. All undercutting made at the order of Engineer will be paid for on the basis of the actual quantity of material excavated. Do not proceed further until instructions are received and necessary measurements made for purposes of establishing additional volume of excavation.
   3. No extra payment will be made if removal is required as a result of poor dewatering techniques.
   4. Undercutting which is specifically indicated on the Drawings or herein specified, shall be included in the base Bid.
   5. Soil removed may be used as fill in areas not below driving surfaces, structures, or utility structures.
   6. Compact subgrade at bottom of undercut prior to placing fill.
   7. Place and compact specified fill in undercut.
   8. Lateral extent of undercut shall be a horizontal distance equal to the depth of undercut below structure, utility structure, or driving surface.

F. Excavating:
   1. All excavation shall be by open cut from the surface except as herein specified or as indicated on the Drawings.
   2. If required because of excess water conditions, place stone stabilization course prior to proceeding with construction. Place filter fabric over stone stabilization course.

G. Rock Excavation:
   1. Notify Engineer prior to removal if rock is encountered.
   2. Where rock is encountered within the excavation, expose the surface of the rock sufficient to permit adequate measurements to be taken before the rock excavation is started.

3.2 FILL

A. General:
   1. Do not place fill until the subgrade been examined by Engineer or independent testing laboratory.
   2. Place fill in even layers not exceeding 10 inches in depth and thoroughly compact as herein specified.
   3. Do not place additional fill until compaction on a lift complies with specification requirements.
   4. If an analysis of the soil being placed shows a marked difference from 1 location to another, the fill being placed shall not be made up of a mixture of these materials.
   5. Handle each different type of material continuously so that field control of moisture and density may be based upon a known type of material.
   6. Do not place fill following a heavy rain without first making certain on isolated test areas that compaction can be obtained without damage to the already compacted fill.
   7. Do not place fill on frozen subgrade.

B. Compaction:
   1. Select compaction equipment to achieve the required compaction without damaging adjacent structures, utility structures, or driving surfaces.
   2. Suggested Equipment Selections:
      a. If soil is predominantly granular, use pneumatic tired or vibratory drum rollers loaded to not less than 325 pounds in accordance with rated inch of tire width.
      b. For clay fills, compact each layer with sheepsfoot rollers. Rollers shall have staggered rows of feet projecting not less than 7 inches from drum and shall be loaded to produce at least 200 pounds per square inch of tamping area in contact with the ground.
      c. Compact around structures and utility structures with hand operated vibrating compactors for granular soils and Barco rammer type compactors for clay soils.

C. Moisture:
   1. Compact all fill with the moisture content as specified.
   2. If fill material is too wet, provide and operate approved means to assist the drying of the fill until suitable for compaction.
   3. If fill material is too dry, provide and operate approved means to add moisture to the fill layers.

3.3 GRADING

A. General:
   1. Perform all rough and finish grading required to attain the elevations indicated on the Drawings.
   2. Perform rough grading to an accuracy of ± 0.10 feet.
   3. Perform finish grading to an accuracy of ± 0.05 feet.
   4. Comply with all excavating and fill requirements specified herein during grading operations.

B. Grading Around Buildings: Control the grading around buildings so the ground is pitched to prevent water from running into the excavated areas of a building or damaging other Site features.

C. Treatment After Completion of Grading:
   1. After grading is completed, permit no further excavation, filling, or grading, except with the approval of Engineer.
   2. Use all means necessary to prevent the erosion of freshly graded areas during construction and until such time as permanent drainage and erosion control measures have been installed.

D. Topsoil: All graded areas, outside of buildings and driving surfaces, shall receive 4 inches of topsoil.

3.4 EXCESS WATER CONTROL

A. Regulations and Permits: Comply with soil erosion control permits in accordance with Mich. P.A. 451, Part 91 of 1994, the Natural Resource and Environmental Protection Act, and all pertinent rules, laws, and regulations.

B. Unfavorable Weather:
   1. Do not place, spread, or roll any fill material during unfavorable weather conditions.
   2. Do not resume operations until moisture content and fill density are satisfactory to Engineer or independent testing laboratory.

C. Pumping and Drainage:
   1. Provide, maintain, and use at all times during construction adequate means and devices to promptly remove and dispose of all water from every source entering the excavations or other parts of the Work.
   2. Dewater by means which will ensure dry excavations, preserve final lines and grades, and do not disturb or displace adjacent soil. Use wells, portable pumps, temporary underdrains or other methods as is necessary.
   3. Perform Pumping and Drainage:
      a. In such a manner to cause no damage to property or structures and without interference to the rights of the public, owners of private property, pedestrians, vehicular traffic, or the work of other contractors.
      b. In accordance with all pertinent laws, rules, ordinances and regulations.
   4. Do not overload or obstruct existing drainage facilities.
   5. Provide berms or channels to prevent flooding of subgrade. Promptly remove all water collected in depressions.

3.5 DISPOSAL OF EXCESS EXCAVATED MATERIAL

A. General:
   1. Remove and properly dispose of all excavated material not needed to complete filling and grading.
   2. Dispose of excess excavated material at a location off the Site.
   3. Dispose of excess topsoil at a location off the Site.
   4. Disposal of all materials shall not violate laws, rules, regulations and the like regarding the filling of flood plains, wetlands and other environmentally sensitive areas.
   5. Provide adequate controls to maintain disposal sites in a neat and safe conditions by periodic leveling of material and such other practices as are necessary.
   6. Provide all soil erosion control measures necessary to prevent soil erosion and sedimentation of wetlands, rivers, ditches, or similar low lying areas.

3.6 CLEANUP

A. Upon completion of the work of this Section, remove all excess excavated material, trash, and debris resulting from construction operations. Remove equipment and tools. Leave the Site in a neat and orderly condition acceptable to Engineer.

END OF SECTION 31 22 00

SECTION 31 23 03 – EXCAVATION AND FILL FOR UTILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the furnishing and installation of the major items listed below:
   1. Excavation and trenching in earth and in rock.
   2. Disposal of items from clearing and unsuitable or excess excavated materials.
   3. Complete drainage of excavations.
   4. Temporary or permanent sheeting, bracing and shoring of excavations.
   5. Installation of normal and special foundations, bedding and backfill materials.

1.3 REFERENCES

A. Except as herein specified or as indicated on the Drawings, the work of this Section shall comply with the following:
   1. ASTM Standard Specifications:
      a. D1556 - Density and Unit Weight of Soil In Place by the Sand-Cone Method.
      b. D1557 - Laboratory Compaction Characteristics of Soil Using Modified Effort.
      c. D2321 – Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
      d. D2922 - Density of Soil and Soil-Aggregate in Place by Nuclear Methods.
   2. State DOT Current Standards:
      a. Specifications for Construction.
      b. Standard Plans.

1.4 DEFINITIONS

A. Terms:
   1. Bedding: The material placed around a utility between 4 inches below to 12 inches above the utility the full width of the trench.
   2. Driving Surface: A pavement, curb, or sidewalk.
   3. Excavation:
      a. Removing the following materials from their present location:
         1) Native below-grade material such as soil, rocks, boulders less than 1/2 cubic yard in volume, and buried trees.
         2) Man-made items such as, but not necessarily limited to:
            a) Bituminous and concrete paving.
            b) Curbs.
            c) Riprap.
            d) Head walls.
            e) Underground utilities.
            f) Manholes and catch basins.
            g) Foundations.
            h) Sidewalks.
   4. Extra Earth Excavation: Excavation of native material from below the normal trench bottom.
   5. Foundation Material: The material placed in a trench undercut to replace extra earth excavation.
   6. Hardpan:
      a. Cemented soil layers.
      b. Is not hard clay layers that are not cemented.
   7. Imported Material: Soil material which is purchased by Contractor and hauled onto the Site.
   8. Native Material: Soil and other natural earth materials, except rock, which are existing on the Site prior to the start of Work.
   9. Normal Trench Bottom: The surface of the undisturbed native material at an elevation 4 inches below the bottom of the utility.

10. Pavement: Any combination of subbase, base course and concrete, bituminous or aggregate surface course, including shoulders, placed on a subgrade. Includes roadways, parking areas, driveways, and bituminous seal coat.
11. Rock Excavation:
    a. Excavation of igneous, metamorphic or sedimentary rock or hardpan which cannot be excavated without continuous drilling and blasting or continuous use of a ripper or other special equipment.
    b. Excavation of boulders of 1/2 cubic yard or more in volume.
12. Special Foundations:
    a. Specially constructed systems for support of underground utilities such as timber piling, concrete foundations and surcharge techniques.
    b. Extra earth excavation and placing imported or native materials are not special foundations.
13. Structure: A building, retaining wall, tank, footing, slab, or other similar construction.
14. Suitable Material:
    a. Native material excavated from the trench and approved as backfill by Engineer or independent testing laboratory.
    b. Not used under or within 1 on 1 slope of driving surfaces or structures.
    c. Placed between the top of the bedding or trench backfill as indicated on the Drawings and the bottom of the surface restoration.
15. Trench Backfill:
    a. The material placed between the top of bedding and the bottom of suitable material, the surface restoration or driving surface, as indicated on the Drawings.
    b. Used under and within 1 on 1 slope of driving surfaces or structures.
16. Utility Structure: Manhole, catch basin, valve chamber, junction chamber, water main valve, or other similar utility appurtenance.
17. Other Definitions: Other earthwork terms not defined herein or in the Contract Documents shall be as defined in state DOT Standard Specifications for Construction.

1.5 DESIGN AND PERFORMANCE REQUIREMENTS

A. Trench Bottom Suitability:
1. Be responsible for the suitability of the normal trench bottom in supporting the utility, bedding and backfill.
2. Notify Engineer and await Engineer's decision if a possible unsuitable condition exists.
3. Poor dewatering techniques or lack of excess water control shall not be a reason for additional payment for remedial measures.

B. Trench Wall Stability:
1. Be responsible for the trench configuration, including sheeting, shoring and bracing necessary to support trench side walls from collapsing.
2. Be responsible for the structural design and stability of a pipe-laying box if utilized on the Project to prevent trench walls from collapsing.

1.6 QUALITY ASSURANCE

A. Testing: Testing will be performed in accordance with Division 01 Section "Testing Services for Buried Utilities, Roadways, and Site Projects." and the Contractor’s Quality Control Plan.

B. Compaction:
1. Determine density by the modified Proctor method, ASTM D1557.
2. Compact granular trench backfill and bedding to at least 95% maximum density.
3. Compact suitable backfill material to at least 90% maximum density.
4. The first 12 inches of native material at the bottom of utility trenches:
    a. Test for density.
    b. Compact to at least 95% maximum density (modified proctor) if the existing density is below 95% maximum density (MP).
    c. Compact clay soil to at least 98% maximum density in accordance with standard proctor ASTM D698, if below 98% maximum density (SP).

1.7 SUBMITTALS

A. Action Submittals: For imported materials:
   1. Source.
   2. State DOT classification.
   3. Sieve Analysis.

1.8 PROJECT CONDITIONS

A. Dust Control:
   1. Use all legal means necessary to control dust on and near the Work and on and near off-site borrow areas if such dust is caused by Contractor's operations during performance of the Work or if resulting from the condition of the Site when earthwork operations are suspended.
   2. Moisten or otherwise treat haul roads, delivery roads, temporary site access roads and other surfaces as required to prevent dust from being a nuisance to the public, neighbors, and concurrent performance of other work on the Site.
   3. Scrape, broom, or vacuum adjacent streets to remove tracked dirt every Friday afternoon, or more as necessary if directed by Engineer. Utilize vacuum if dust from brooming is excessive in opinion of Engineer.

B. Existing Structures, Utility Structures, and Utilities:
   1. Call MISS DIG to locate existing underground utilities prior to starting excavation.
   2. Where utilities, utility structures or structures are encountered which are in active use:
      a. Provide adequate protection for them.
      b. Be responsible for damage to them.
   3. Provide stand-by utility service if temporary removal is necessary for a period exceeding 2 hours.
   4. Where utility service connections to occupied buildings must be temporarily disconnected, give 48 hours notice to the affected occupants of the time and duration of the anticipated shutoff.
   5. Notify Fire Department 48 hours in advance if water main or fire supply line shutoff is required.
   6. Raise, lower, or move underground utilities, utility structures or structures which interfere with the utility or utility structure being constructed as part of this Work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General:
   1. Approval Required: Material shall be subject to the approval of Engineer or independent testing laboratory.
   2. Notification: For approval of imported material, notify Engineer or independent testing laboratory at least 1 week in advance of intention to import material, designate the proposed borrow area, and permit Engineer or independent testing laboratory to sample as necessary from the borrow area for the purpose of making acceptance tests to prove the quality of the material.

B. Material Sources and Uses:
   1. Imported Material:
      a. Foundation material.
      b. Bedding.
      c. Pea stone.
      d. Trench backfill.
   2. Native material unless quantity is not sufficient; then shall be imported material: Suitable material.

C. Foundation Material for Crushed Stone: 1-1/2-inch maximum size.

D. Bedding:
   1. For Pipes Less Than 36 Inches:
      a. MDOT 902 Granular Material Class II modified to 100% passing a 1/2-inch sieve
   2. For Pipes 36 Inches and Larger:
      a. Pea stone bedding to spring line.
      b. Geotextile filter fabric over pea stone.
      c. MDOT Granular Material Class II to 1 foot above pipe.
   3. For Utility Structures:
      a. Sand gravel fill of such gradation that 100% will pass a 1/2-inch sieve and not more than 10% by weight is lost by washing, or
      b. MDOT 902 Granular Material Class II modified to 100% passing a 1/2-inch sieve.

E. Pea Stone: Clean stone with 100% passing a 3/8-inch sieve and 100% being retained on a No. 8 sieve.

F. Trench Backfill: MDOT 902 Granular Material Class II.

G. Suitable Material:
   1. Native Material Which is Used as Backfill:
      a. Exclusive of gray or blue clay, peat, organic matter, or frozen lumps.
      b. Containing no rocks or lumps over 3 inches in greatest dimension.
      c. Having a moisture content such that material is capable of being compacted to 90% maximum density.
   2. MDOT 902 Granular Material Class II if native material is not adequate in opinion of Engineer.

2.2 OTHER MATERIALS

A. Other materials, not specifically described but required for proper completion of the work of this Section, shall be as selected by Contractor subject to the approval of Engineer or independent testing laboratory.

PART 3 - EXECUTION

3.1 GENERAL

A. Excavating, Backfilling and Compacting:
   1. For Utility Structures: In accordance with this Section.

B. Obstructions:
   1. Remove and dispose of buried trees, rocks, boulders, driving surfaces, pipes and the like, as required for the performance of the Work.
   2. Exercise care in excavating around catch basins, inlets and manholes.
   3. Avoid removing or loosening castings.
   4. Repair and replace damaged or displaced castings; remove dirt entering utility structures during the performance of the Work at no additional cost to Owner.

C. Cutting Paved Surfaces and Similar Improvements:
   1. Cut pavement prior to excavating.
   2. Cuts shall be a minimum of 1-foot wider than trench on each side. When the remaining width of paved surface is less than 4 feet, remove the entire paved surface.
   3. Before removing pavement, mark the pavement neatly, paralleling pipe lines and existing street lines. Space the marks the width of the trench.
   4. Concrete:
      a. Pavements: Saw cut if over 3 feet from expansion or construction joint, otherwise remove to joint.
      b. Sidewalks: Remove to joints.
      c. Curb and Gutter: Remove to joints.
   5. Final Surface Course Bituminous: Saw cut joints unless otherwise approved by Engineer.
   6. Do not disturb or damage the adjacent pavement. If the adjacent pavement is disturbed or damaged, remove and replace the damaged pavement.
   7. Contractor may tunnel under curbs that are encountered. Replace curb disturbed by construction.
   8. Dispose of materials removed.

D. Utilities to be Abandoned:
   1. When pipes, conduits, sewers or utility structures are removed from the trench leaving dead ends in the ground, fully plug such ends with brick and mortar.
   2. Entirely remove abandoned utility structures unless otherwise specified or indicated on the Drawings.
   3. Remove from the excavation materials which can be readily salvaged and store on the Site.
   4. Salvageable materials will remain the property of Owner unless otherwise indicated by Owner.

E. Extra Earth Excavation:
   1. If soft material, which in the opinion of Engineer or independent testing laboratory is not suitable, is encountered below the normal trench bottom or below a utility structure Engineer may order the removal of this soft material and its replacement with specified material in order to make a suitable foundation for the construction of the utility or utility structure.
   2. Extra earth excavation made at the order of Engineer will be paid for on the basis of the actual quantity of material excavated. Do not proceed further until instructions are received and necessary measurements made for purposes of establishing additional volume of excavation.
   3. No extra payment will be made if removal is required as a result of poor dewatering techniques.
   4. Special foundations shall be determined on an individual basis by Engineer in cooperation with Contractor, unless otherwise provided in the Contract Documents.

3.2 EXCAVATION AND TRENCHING

A. General:
   1. By open cut from surface unless designated otherwise.
   2. Slope sides of trench adequately for protection of the Work and safety of workers.

B. Maximum Length of Open Trench: 200 feet.

C. Width:
   1. Minimum Clearance on Each Side of Utility:
      a. To 16 Inches Diameter: 8 inches.
      b. Greater Than 16 Inches Diameter: Pipe outside diameter times 1.25 plus 12 inches.
   2. Maximum Width of Trench at Top of Bedding:
      a. Up Through 30-Inch Diameter Utility: 16 inches plus utility diameter.
      b. Greater Than 30-Inch Diameter Utility: 24 inches plus utility diameter.
   3. Maximum Width of Trench at Ground Surface:
      a. Not outside of the property line or easement.
      b. As required for protection of the Work and safety of workers.
      c. Use sheeting, bracing and shoring if required.
   4. Provide sufficient space in the trench to permit the joint to be properly made.

D. Depth:
   1. Excavate to provide the elevations, grades, and depths of cover indicated on the Drawings and herein specified.
   2. The 4 inches of required bedding material below the utility may be omitted if:
      a. Approved by Engineer.
      b. Contractor arranges and pays for testing of the native material.
      c. The native material complies with MDOT 902 Granular Material Class II material, modified so that 100% passes a 1/2-inch sieve.
      d. The material is compacted as specified herein.
   3. Excavate to the normal trench bottom elevation with an accuracy of ± 0.10 feet.

E. Rock Excavation:
   1. Where rock excavation is encountered within the excavation, expose the surface of the rock sufficient to permit adequate measurements to be taken before the rock excavation is started.
   2. Notify Engineer prior to removal if rock is encountered.
   3. No utility shall be within 6 inches of rock.
   4. Blasting:
      a. Only with permission of Engineer and in accordance with laws and regulations applying thereto.
      b. Secure permit if required.
      c. Notify utility and public agencies.
      d. Explosives shall be used with extreme care by experienced workers only.

e. Hours shall be fixed by Engineer.
f. Contractor solely responsible for safety, damage and control of blasting operations.

F. Bedding:
1. Place the bedding material up to 1/8 the height of the utility. Compact as herein specified.
2. Accurately shape the bedding material to fit the pipe shape. Recess the bedding to relieve the pressure on the bell or other projecting utility joint.
3. After laying out the utility, tamp additional bedding in place up to the midpoint of the utility. Use hand-operated compactors to achieve the required compaction.
4. Place additional bedding up to 12 inches above the top of the utility. Use hand operated compactors to achieve required compaction.
5. Place bedding in maximum lifts of 10 inches.
6. No payment shall be made for aggregate or stone bedding when used for Contractor convenience.

G. Trench Backfill:
1. Use backfill material as each Drawing detail indicates and as the material is defined herein.
2. Place backfill in 8 to 10-inch lifts and compact as herein specified. Engineer will consider greater lifts if testing indicates that the required compaction is being achieved.

H. Utility Structures:
1. Place and compact specified bedding below utility structures.
2. Backfill around utility structures shall be of the same type backfill as that required for the trench in accordance with these Contract Documents.
3. Place backfill in 8 to 10-inch lifts and compact as herein specified.

3.3 DISPOSAL OF EXCESS EXCAVATED MATERIAL

A. General: Contractor responsibility and expense.

B. Disposal Sites:
1. Material desired by Owner shall be disposed of by Contractor in the following priority order:
a. At locations designated by the Contract Documents.
b. At locations on or within 2 miles of the Project Site designated by Owner after construction starts.
c. At locations on the Project Site by written arrangement with individual property owners.
d. Owner may choose not to accept certain materials, including but not necessarily limited to, items from clearing, muck, peat, marl and whole or broken man-made items removed by construction.
2. Material not desired by Owner shall be disposed of in a location of the Island determined by Contractor.
3. Disposal of materials shall not violate laws, rules, regulations and the like regarding the filling of flood plains, wetlands and other environmentally sensitive areas.
4. Provide adequate controls to maintain disposal sites in a neat and safe condition by periodic leveling of material, and such other practices as are necessary.
5. Provide soil erosion control measures necessary to prevent soil erosion and sedimentation of wetlands, rivers, ditches, or similar low lying areas.

3.4 EXCESS WATER CONTROL

A. Regulations and Permits: Comply with soil erosion control permit in accordance with Mich. P.A. 451, Part 91 of 1994, the Natural Resource and Environmental Protection Act, and all pertinent rules, laws, and regulations.

B. Unfavorable Weather:
1. Do not place, spread or roll fill material during unfavorable weather conditions.
2. Do not resume operations until moisture content and fill density are satisfactory to Engineer or independent testing laboratory.

C. Pumping and Drainage:
1. Provide, maintain and use at all times during construction adequate means and devices to promptly remove and dispose of water from every source entering the excavations or other parts of the Work.
2. Dewater by means which will ensure dry excavations, preserve final lines and grades, and do not disturb or displace adjacent soil. Use wells, portable pumps, temporary underdrains, or other methods as necessary.

3. Perform Pumping and Drainage:
    a. In such a manner to cause no damage to property or structures and without interference to the rights of the public, owners of private property, pedestrians, vehicular traffic, or the work of other contractors.
    b. In accordance with pertinent laws, rules, ordinances, and regulations.
4. Do not overload or obstruct existing drainage facilities.

D. General:
1. Keep excavations dry during construction.
2. Remove water by use of wells, well points, portable pumps, bailing, drains, underdrains or other acceptable methods.
3. Provide crushed stone or gravel as required to aid dewatering operations.
4. Divert or temporarily reroute existing sewers and drainage of discharge lines to adequate and acceptable outlets during construction. Contractor responsible to ascertain availability of outlets.
5. Divert surface water from entering excavations by construction and maintenance of channels or berms.
6. Sediment traps and other soil erosion control measures shall prevent soil particles from entering any sewer, watercourse or similar conveyance.
7. Protect utilities, utility structures, and structures, existing and new, from hydrostatic uplift.

3.5 SHEETING, SHORING AND BRACING EXCAVATIONS

A. General:
1. Furnish, put in place and maintain sheeting, bracing and shoring as may be required to properly support the sides of excavations and to prevent movement of earth which could in any way injure the Work or adjacent property.
2. Exercise care in the removal of sheeting, shoring, bracing and timbering to prevent collapse or caving of the excavation faces being supported and damage to the Work and adjacent property.
3. A pipe-laying box may be used in lieu of sheeting.

B. Sheeting:
1. Do not install by jetting.
2. Remove as backfilling proceeds, unless ordered left in place by Engineer. Use care to fill and compact voids created by removal, especially below mid-height of utility.
3. Sheeting Left in Place:
    a. Requires written approval of Engineer.
    b. Cut off minimum of 2 feet below finished grade.

3.6 CLEANUP

A. Upon completion of the work of this Section, remove all excess excavated material, trash, and debris resulting from construction operations. Remove equipment and tools. Leave the Site in a neat and orderly condition acceptable to Engineer.

END OF SECTION 31 23 03

SECTION 31 23 19 – DEWATERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Sections includes the design, furnishing and installation of a dewatering system.
   1. Determination by Contractor:
      a. For all areas where mandatory dewatering is not required.
      b. Determine the need for a dewatering system. The water table does fluctuate seasonally and dewatering will be required at certain times of the year.
      c. Contractor may choose between a well dewatering system by a qualified dewatering Subcontractor and an open excavation pump and bail system by either a qualified dewatering Subcontractor or Contractor's own labor forces.

1.3 DESIGN AND PERFORMANCE REQUIREMENTS

A. Design:
   1. The design of the dewatering system used shall be the responsibility of Contractor.
   2. The dewatering system selected shall result in a dry excavation that is not in a quick condition.
   3. Design dewatering system so that no silts, clays or other fine grained materials are removed from the natural geological formation.
   4. Wells shall be 12-inch diameter, minimum.
   5. Provide wells to 10 feet below the bottom of the excavation minimum, unless an impervious material is encountered.
   6. Monitor the dewatering system at frequent intervals, including nights and weekends, as necessary, so that an equipment failure will not cause significant delay. Ensure that standby equipment is available in case of equipment or power failure.
   7. Maintain lowered water table continuously (day and night) until the structure to be built or the installation of utilities is completed to such an extent that no damage from hydrostatic pressure, flotation or other causes will result.

B. Costs: Dewatering shall be incidental to the unit price payments for underground systems.

C. Protection of Adjacent Property:
   1. Design, construct, and operate system so that no damage occurs to adjacent property, structures, and wells.
   2. Monitor adjacent property, structures, and wells to ensure no damage occurs.
   3. Correct damages to adjacent property, structures and wells due to installation or operation of dewatering systems.

1.4 SUBMITTALS

A. Delegated Design Submittals: Include the following for Dewatering plan:
   1. System description.
   2. Number, size, and length of wells.
   3. Estimated pumping rate.
   4. Pumping equipment.
   5. Discharge location.
   6. Sedimentation control procedures.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Comply with the Dewatering Well Act, Soil Erosion Control Act, and other state and local laws that affect dewatering work.
   2. Obtain all permits necessary to perform dewatering operation, including, but not necessarily limited to:
      a. Soil erosion control permit, or modifications to existing permit.
      b. All new discharge permits and modifications to existing discharge permits.

1.6 SEQUENCING AND SCHEDULING

A. Coordinate Dewatering Work with Scheduling of Other Trades:
   1. To ensure adequate protection of personnel and materials.
   2. In a manner that will not unduly delay the Project.

PART 2 - PRODUCTS

2.1 QUALIFIED DEWATERING SUBCONTACTORS

A. Kelley Contract Dewatering Company, Grand Rapids, Michigan; Griffin Dewatering Corporation, Hammond, Indiana; Contract Dewatering Services, Inc., Saranac, Michigan; DeWind Dewatering Service, Inc., Holland, Michigan; or equal.

2.2 MATERIALS

A. Utilize all materials as necessary to perform the dewatering work including wells, pumps, screens, gravel packs, observation wells, piping, power source and standby gas or diesel equipment.

PART 3 - EXECUTION

3.1 APPLICATION

A. Disposal of Water:
   1. Establish means and methods for disposal of all water pumped from the dewatering system which conform to all applicable laws, rules and codes.
   2. Construct and maintain a sedimentation basin or other structures and measures to comply with discharge permit.
   3. Monitor discharge to ensure compliance with permits, and to ensure that no damage to receiving ditch, stream, or sewer is occurring.
   4. Discontinue discharge if damage to receiving ditch, stream, or sewer is occurring, and repair damage.

3.2 CLEANING

A. Prior to completion of the work of this Section, clean all affected areas in accordance with Division 01 Section “Cleaning and Waste Management.”

END OF SECTION 31 23 19

SECTION 31 25 00 – EROSION AND SEDIMENTATION CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the furnishing, installation and maintenance of soil erosion and sedimentation control (SESC) measures.
   1. Minimum SESC measures/Best Management Practices (BMP) are indicated on the Drawings. These measures are to be installed correctly before any grading or excavating begins on the Site. Contractor may add additional BMP's as required by their operations, such as temporary stock piles, equipment storage etc.
   2. Stage Construction and stabilization activities to minimize the amount of disturbed area at any one time.
   3. Remove sediment caused by erosion from storm water before it leaves the Site or enters waters of the state.
   4. Place soil piles away from drainage courses. Soil piles must be protected from precipitation and wind with non-erosive covers or other BMP's.
   5. Provide anti-tracking areas for haul roads and equipment. Sweep streets, parking areas regularly as needed.
   6. Dust control must be implemented on all sites exposed to wind erosion.
   7. Keep copies of permits and inspections on Site at all times.

1.3 REFERENCES

A. Except as herein specified or as indicated on the Drawings, the work of this Section shall comply with the following:
   1. Soil erosion and sedimentation control rules and guidelines of:
      a. State of Michigan R323.2190 National Permit for stormwater discharge from Construction (Michigan's "Permit by Rule").
      b. Michigan Natural Resources and Environmental Protection Act, Part 31 of Act 451 of 1994 Soil Erosion and Sedimentation Control (Water Resources Protection Act).
      c. Part 91, Soil Erosion and Sedimentation Control, of the Natural Resources and Environmental Protection Act (Soil Erosion and Sedimentation Control (SESC).
      d. EGLE Nonpoint Source Best Management Practices Manual.
      e. Luce, Mackinac, Alger, and Schoolcraft (LMAS) District Health Department Sanitarian.
   2. ASTM Standards:
      a. A974 - Standard Specification for Welded Wire Fabric Gabions and Gabion Mattresses (Metallic-Coated or Polyvinyl Chloride (PVC) Coated).
      b. C33/C33M - Standard Specification for Concrete Aggregates.
      c. D4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
      d. D4751 -Standard Test Method for Determining Apparent Opening Size of a Geotextile.
      e. D4992 - Standard Practice for Evaluation of Rock to be Used for Erosion Control.
      f. D5313 - Standard Test Method for the Evaluation of Durability of Rock for Erosion Control Under Wetting and Drying Conditions.
      g. D6092 - Standard Practice for Specifying Standard Sizes of Stone For Erosion Control.
      h. D6459 – Standard Test Method for Determination of Erosion Control Blanket (ECB) Performance in Protecting Hillslopes from Rainfall-Induced Erosion.
      i. D6461, D6462 - Standard Practice for Silt Fence Materials and Installation.
      j. D6599 - Practice for Construction of Live Fascines on Slopes.
      k. D6711 - Practice for Specifying Rock to Fill gabions, Revet Mattresses, and gabion Mattresses.

1.4 SUBMITTAL

A. Action Submittals (Manufacturers information):
   1. Mulch blankets.
   2. Geotextile fabric.
   3. Silt Fence.
   4. Seed mixtures.
   5. Tacking Agents.
   6. Fertilizer.

B. Informational Submittals:
   1. Sequence of Construction in sufficient detail as requested by Engineer.

1.5 QUALITY ASSURANCE

A. Performance Standard:
   1. Compliance with the Soil erosion Control Permit (Part 91) and the Michigan Permit by Rule. The SESC measures indicated on the Drawings and specified here in are a minimum requirement. If more SESC measures are required to comply with the permit, notify the Engineer responsible for preparation of the SESC plan for plan amendment. Additional SESC measures required due to the Contractor's operations will not be considered for additional payment.

B. SESC Preconstruction Meeting:
   1. Conduct a field evaluation of the Site with the Engineer, the Local Enforcing Agent, and the Contractor's Superintendent after all initial SESC measures are installed and prior to any excavation work.
   2. This meeting shall be scheduled and organized by the Contractor.
   3. Review the installed SESC measures by walking the Site and confirm compliance to the Permit and the approved SESC Plan.
   4. Review the location for display of the permit.
   5. Review location for SESC inspection log.

C. Stop Work Order:
   1. Owner reserves the right to issue a Stop Work Order if soil erosion and sedimentation controls are not properly installed or maintained.
   2. Work performed under a Stop Work Order will not be considered for payment.
   3. Costs resulting from delay due to issuance of a Stop Work Order shall be the responsibility of Contractor.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original, unbroken, brand marked containers or wrapping as applicable.

B. Handle and store materials in a manner which will prevent deterioration, damage, contamination with foreign matter, damage by weather or elements, and in accordance with manufacturer's directions.

C. Reject damaged, deteriorated or contaminated material and immediately remove from the Site. Replace rejected materials with new materials at no additional cost to Owner.

PART 2 - PRODUCTS

2.1 SOIL EROSION AND SEDIMENTATION CONTROL MATERIALS

A. Stabilized Construction Entrance:
   1. Stabilize a pad of clean crushed stone located at points where traffic will be accessing a construction site. Minimize construction access points to locations as indicated on the Drawings.
   2. Stone Size - Use ASTM C33, size No. 2 (2-1/2-inch to 1-1/2-inch) or 3 (2 inch to 1 inch). Use clean crushed angular stone. Crushed concrete of similar size may be substituted, but will require more frequent upgrading and maintenance.
   3. Place on woven geotextile fabric if underlying soils are soft. TerraTex GS, or equal.
   4. Thickness: Not less than 4 inches.
   5. Width: Not less than full width of points of ingress or egress or a minimum of 10 feet.

6. Length: 50 feet minimum where the soils are course grained (sands or gravels) or 100 feet minimum where soils are fine grained (clays or silts), except where the traveled length is less than 50-feet or 100 feet respectively. These lengths may be increased where field conditions dictate. Stormwater from up-slope areas shall be diverted away from the stabilized pad where the slope of the access road exceeds 5%, a stabilized base of Hot Mix Asphalt Base Course.

B. Permanent Vegetative Cover:
   1. Grade as needed and feasible to permit the use of conventional equipment for seedbed preparation, seeding, mulch application, and mulch anchoring.
   2. Immediately prior to seeding and topsoil application, the subsoil shall be evaluated for compaction.
   3. Topsoil should be handled only when it is dry enough to work without damaging the soil structure. A uniform application to a depth of 4 inches (unsettled) is required on all sites. Topsoil shall be amended with organic matter, as needed, in accordance with the Standard for Topsoiling.

C. Mulch Blanket:
   1. 4H:1V: Straw; North American Green S-75; LANDLOK S1; or equal
   2. 3H:1V: Straw; North American Green S-150; LANDLOK S2; or equal.
   3. 2H;1V: Straw and Coconut: North American Green SC-150; North American Green P-300, LANDLOK SC2; or equal.
   4. 1.5H:1V: Coconut: North American Green C-125; LANDLOK C2; or equal.
   5. Anchoring Staples or Pins:
   6. Hardwood stakes at least 6 inches long; or
   7. North American Green Bio-Stake blanket pins at least 6 inches long;
   8. Steel anchoring pins are not allowed without written permission of the Engineer.

D. Tacking Agents:
   1. Materials: Polyacrylamide, acrylamide copolymer, hydro-colloid polymers, marker dye.
   2. pH Range: 7.0 ±0.2.
   3. Surface Tension: 73.9 dynes/cm, based on simulated field application after 5 minutes of mechanical agitation.
   4. Viscosity: 102 CPS ±2, Saybolt value, based on 30 pounds per 1,000 gallons of water and 197 CPS ±2, Saybolt value, based on 60 pounds per 1,000 gallons of water, based on simulated field application after 5 minutes of mechanical agitation.
   5. University tested to reduce erosion 68.6% and reduce water runoff 21.7% on a 45% slope without having to cure (dry out), effective immediately after hydro-seeding application.
   6. Terra-Mulch Tacking Agent 3 by Profile Products LLC.

E. Dewatering Filter Bags:
   1. Ultratech International, Inc.: Ultra Dewatering Bag, SedCatch dewatering Bag; or equal.
   2. Manufactured with pump pipe connection sized to match pump hose.
   3. Nonwoven Geotextile, Needle Punched Polypropylene, 8 oz/syd (min).
   4. Grab Tensile: 205 pounds in accordance with ASTM D4632 (min).
   5. Flow Rate: 90 gpm/sft in accordance with ASTM D4491 (min).
   6. Apparent Opening Size (AOS): 80 US Sieve.

F. Geotextile Silt Fence:
   1. Synthetic Industries, Terra TexSF-90,
   2. Woven, high strength polypropylene.
   3. Grab Tensile Strength: 124/101 lbs (min) in accordance with ASTM D4632 (min).
   4. Apparent Opening Size (AOS): 30 US sieve (max) in accordance with ASTM D4751 (max).
   5. Water Flow Rate: 10gpm/sft (min) in accordance with ASTM D4491 (min).
   6. Wood Stakes, Hardwood: 1.5-inch x 1.5-inch x 48-inch (min), 6 foot spacing (max) with 3/8-inch thick lath fastening bar.

PART 3 - EXECUTION

3.1 GENERAL

A. Standards:
   1. Achieve Effective Erosion Control to prevent erosion of Site slopes and ditches.
   2. Achieve effective control of sedimentation to prevent any offsite discharge or tracking of Site soils.

3. Maintain soil erosion and sedimentation controls until the Site is stable. Definition of stable site is final concrete and/or asphalt paving is complete, and all turf areas have 80% growth.
4. Do not remove temporary soil erosion and sedimentation control measures until Site is determined to be stable by the Engineer.

3.2 DUST CONTROL

A. Prevent blowing and movement of dust from exposed soil surfaces, prevent on Site and off Site damage and health hazards and improve traffic safety:
   1. The following methods should be considered for controlling dust.
      a. Mulches.
      b. Temporary Vegetative Cover.

3.3 CONSTRUCTION ENTRANCE DRIVE

A. Employ water truck and street sweeper as necessary to keep sediment off of on Site and off Site roadways. The entrance must be maintained in a condition which will prevent tracking or flowing of sediment onto roadways. This may require periodic top dressing with additional stone or additional length as conditions demand and repair and/or cleanout of any measures used to trap sediment. All sediment spilled, dropped, washed, or tracked onto roadways (public or private) or other impervious surfaces must be removed immediately.

B. Where accumulation of sediment is inadequately cleaned or removed by conventional methods, a power broom or street sweeper will be required to clean paved or impervious surfaces. All other access points which are not stabilized must be blocked off.

3.4 PERMANENT VEGETATIVE COVER

A. General:
   1. Seed all disturbed areas within 5 days of final grading.
   2. Apply uniformly at a minimum rate of 3 to 5 pounds per 1,000 square feet.
   3. Mulch as indicated on the Drawings or as needed to effectively control soil erosion.

3.5 MULCH BLANKET

A. Direction of installation, staple patterns and other requirements in accordance with Manufacturer's directions, and Project Drawing detail sheets.

B. Location: Where indicated on the Drawings or as specified.

3.6 TACKING AGENTS

A. Fiber Mulch Binding:
   1. Flat to 5:1 Slope: 20 pounds per acre.
      a. 4:1 to 3:1 Slope: 30 pounds per acre.
      b. 3:1 to 2:1 Slope: 40 pounds per acre.
      c. Greater than 2:1 Slope: 60 pounds per acre.
   2. Straw Mulch Binding: 30 pounds Tacking Agent III and 150 pounds cellulose fiber per 1,000 gallons of water per acre, or 50 pounds Tacking Agent III per 1,000 gallons of water per acre.

3.7 GEOTEXTILE SILT FENCE

A. Space posts 6 feet center-to-center or closer. Extend at least -12 inches into the ground. Posts shall be constructed of hardwood with a minimum diameter thickness of 1-1/2 inches.

B. Wire Backed silt fence: A metal fence with 6 inch or smaller wire mesh openings and at least 2 feet high may be utilized, fastened to the fence posts, to provide reinforcement and support to the geotextile fabric. Place posts 6 feet on center.

C. Bury geotextile fabric at least 6 inches deep in the ground. Extend The fabric at least 2 feet above the ground. The fabric must be securely fastened to the posts using a system consisting of metal fasteners (nails or staples) and a high strength reinforcement material (nylon webbing, grommets, washers, etc.) placed between the fastener and the geotextile fabric. The fastening system must resist tearing away from the post. Install silt fence in accordance with manufacturer's instructions, and Project Drawing detail sheets.

D. Location: Where indicated on the Drawings or as needed to prevent offsite movement of soil.

3.8 FIBER ROLLS

A. Vertical spacing on slopes:
1. As indicated on the Drawings, or
2. 1:1 slopes: 10 feet apart.
3. 2:1 slopes: 20 feet apart.
4. 3:1 slopes: 30 feet apart.
5. 4:1: slopes: 40 feet apart.

3.9 DEWATERING

A. If during construction excavated facilities need to be dewatered to facilitate or complete the construction process and the water pumped out of the excavated areas contain sediments, these sediments must be removed prior to discharging to receiving bodies of water. This standard does not address the removal of ground water through well points etc.

B. Pumping system must include adequate sized perforated riser pipes, stone filters and sediment pumping bags to achieve desired results. Place the suction hose from the pump inside the inner pipe to begin dewatering. Place the discharge hose in a stabilized area downslope of unstabilized areas to prevent erosion.

C. Sediment Tank / Silt Control Bags may be used when sediment laden water is pumped to trap and retain the sediment. A sediment tank or a silt control bag is to be used when excavations are deep, and space is limited and where direct discharge of sediment laden water to stream and storm drainage systems is to be avoided.
1. Locate containers (tanks or bags) for ease of clean-out and disposal of the trapped sediment and to minimize interference with construction activities and pedestrian traffic. Do not place bags directly into receiving waters.
2. Tank size: The following formula should be used in determining the storage volume of the tank: 1 cubic foot of storage for each gallon per minute of pump discharge capacity. Typical tank configuration is indicated on Standard Detail. Tanks may be connected in series to increase effectiveness.

3.10 DITCH CROSSINGS

A. Banks of Ditches Disturbed Under This Work:
1. Protect within 24 hours after a disturbance unless otherwise approved by Engineer.
2. In no case shall banks be left unprotected more than 7 days.

3.11 BUILDING PROJECT CONSTRUCTION

A. During construction conform to the following general rules:
1. Minimize the amount of earth disturbed at any one time.
2. Establish a construction sequence which includes adequate erosion control.
3. As much as practical, direct stormwater away from the construction area. Direct diverted stormwater to a stable on-Site area.
4. Collect runoff from the Site in sediment basins, traps or through filters.
5. Establish an inspection and maintenance schedule, paying special attention to the beginning of the various stages of construction.

3.12 AIRBORNE SEDIMENT

A. Dust Control:
   1. Use legal means necessary to control dust on and near the Work and on and near off Site borrow areas if such dust is caused by Contractor's operations during performance of the Work or if resulting from the condition of the Site when earthwork operations are suspended.
   2. Treat haul roads, delivery roads, temporary Site access roads and other surfaces as required to prevent dust from being a nuisance to the public, neighbors, and concurrent performance of other work on the Site, and as directed by Engineer.
   3. Periodically scrape and broom adjacent streets and paved areas to remove tracked dirt.

B. Wind Erosion:
   1. Erect and maintain barriers to prevent migration of windblown sediment offsite.
   2. Conduct operations in such a manner as to minimize the amount of Site area exposed to wind erosion.
   3. Be responsible for removal of windblown sediments deposited off Site, including costs for cleaning or repairs required due to sediment deposition and removal.

END OF SECTION 31 25 00

SECTION 32 11 23 – AGGREGATE BASE COURSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes furnishing and installation of the major items listed below:
   1. Base course.
   2. Subbase.

1.3 REFERENCES

A. Except as herein specified or as indicated on the Drawings, the Work of this Section shall comply with the following:
   1. ASTM Standard Test Methods:
      a. D1556 - Density and Unit Weight of Soil In Place by the Sand-Cone Method.
      b. D1557 - Laboratory Compaction Characteristics of Soil Using Modified Effort.
      c. D2922 - Density of Soil and Soil-Aggregate In Place by Nuclear Methods.
   2. State DOT Current Standards:
      a. Specifications for Construction.
      b. Standard Plans.

1.4 DEFINITIONS

A. Terms:
   1. Base Course: The layer of specified material of designed thickness placed on a subbase or a subgrade to support a surface course.
   2. Pavement Structure: Combination of subbase, base course, and surface course, including shoulders, placed on a subgrade.
   3. Plan Grade: Vertical control grade indicated on the Drawings.
   4. Roadbed: The portion of the roadway between the outside edges of finished shoulders, or the outside edges of berms back of curbs or gutters, when constructed.
   5. Roadside: The portion of the right-of-way outside of the roadway.
   6. Roadway: The portion of the right-of-way required for construction, limited by the outside edges of slopes and including ditches, channels, and all structures pertaining to the Work.
   7. Shoulder: The portion of the roadway contiguous with the traveled way for accommodation of stopped vehicles, for emergency use, and for lateral support of base and surface courses.
   8. Subbase: The layer of specified material of designed thickness placed on the subgrade as a part of the pavement structure.
   9. Subgrade: The portion of the earth grade upon which the pavement is to be placed.

1.5 SUBMITTALS

A. Action Submittals: For aggregate:
   1. Source.
   2. MDOT classification.
   3. Sieve analysis.

1.6 QUALITY ASSURANCE

A. Testing of Aggregate Materials: In accordance with Division 01 Section "Testing Services for Buried Utilities, Roadways, and Site Projects."

B. Compaction:
   1. Determine density by the modified Proctor method, ASTM D1557.
   2. Compact subbase and base course to at least 98% maximum density at a moisture content not greater than optimum.

1.7 PROJECT CONDITIONS

A. Dust Control:
   1. Use all legal means necessary to control dust on and near the Work and on and near off-site borrow areas if such dust is caused by Contractor's operations during performance of the Work or if resulting from the condition of the Site when earthwork operations are suspended.
   2. Moisten or otherwise treat haul roads, delivery roads, temporary Site access roads and other surfaces as required to prevent dust from being a nuisance to the public, neighbors, and concurrent performance of other work on the Site.

B. Existing Utility Structures:
   1. Where utility structures are encountered which are in active use:
      a. Provide adequate protection.
      b. Be responsible for damage.
   2. Adjust utility structures to meet plan grade.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General:
   1. Approval Required: Material shall be subject to the approval of independent testing laboratory.
   2. Notification: For approval of materials, notify independent testing laboratory at least 1 week in advance of intention to import material, designate the proposed stockpile area, and permit independent testing laboratory to sample as necessary from the stockpile area for the purpose of making acceptance tests to prove the quality of the material.

B. Subgrade: In accordance with Division 31 Section “Grading.”

C. Material Source: Imported Material:
   1. Subbase.
   2. Base course.

D. Subbase:
   1. MDOT 902, Granular Material Class II.
   2. Thickness compacted in place: 12 inches.

E. Aggregate Base Course:
   1. MDOT 902, Dense Graded Aggregate 21AA.
   2. Thickness Compacted in Place: 8 inches.

F. Temporary Gravel Surface Course:
   1. MDOT 902, Dense Graded Aggregate 21AA, or Engineer Approved equal.
   2. Thickness Compacted in Place: 4 inches.

PART 3 - EXECUTION

3.1 PREPARATION

A. Subgrade:
1. Prepared in accordance with Division 31 Section “Grading.”
2. Maintain in a smooth and compacted condition until the subbase or base course has been placed.
3. Proof roll subgrade prior to placing subbase or base course.
4. No base course shall be placed on the subgrade until it has been approved by Engineer.

3.2 INSTALLATION

A. Subbase:
1. Smooth, spread and compact.
2. Place in one layer, provided that the depth of the compacted layer does not exceed 15 inches.
3. Where the specified depth of subbase is more than 15 inches, place material in layers of approximately equal thickness.
4. Construct to the grade and cross section as indicated on the Drawings.
5. Should the subgrade at any time prior to or during the placing of subbase become soft or unstable to the extent that rutting occurs in the subgrade or to the extent that subgrade material is forced up into the subbase materials, the operation of hauling and placing subbase shall be immediately discontinued. Where subgrade material has become mixed with the subbase material, the mixed material shall be removed and disposed of. After the subgrade has been corrected to the specified condition, new subbase material shall be placed and compacted as specified above.
6. Shape to specified crown and grade within a tolerance of plus 1-inch and maintain in smooth condition.
7. Do not place on a frozen, soft, unstable or rutted subgrade.
8. Remove, dispose of and replace subbase material, at Contractor’s expense, if it becomes mixed with subgrade material.
9. Proof roll subbase prior to installation of base course.

B. Base Course and Temporary Gravel Surface Course:
1. Do not place aggregate base on frozen, soft, unstable or rutted subgrade, subbase, or aggregate base.
2. Additives may be used to ease compaction, shaping, and maintenance of the aggregate surface.
3. Do not rut or distort the subbase material or aggregate base during spreading.
4. Place in uniform layers to such a depth that when compacted, the course will have the thickness indicated on the Drawings.
5. The compacted depth of each layer shall not be more than 6 inches nor less than 3 inches.
6. Compact each layer of aggregate.
7. Place aggregate shoulder material in conjunction with the top layer of aggregate base material.
8. Shape to the crown and grade within a tolerance of ± 0.05 feet unless otherwise specified. The surface of each spreading operation shall be continuously maintained in a smooth condition.
9. Roll the shaped surface, when required, to provide thorough compaction.
10. Where the existing surface is very irregular, the use of a scarifier may be required. Wetting may be required to facilitate shaping the surface and to assist in providing compaction.
11. Remove, dispose of and replace aggregate base material, at the Contractor’s expense, if it becomes mixed with the subbase or subgrade material.
12. Final shaping and compacting shall be accomplished by use of a subgrade machine operating on crawler tracks, or by the use of a maintainer or surface planer, with a rigid frame.
13. If the subgrade, subbase, or aggregate base is damaged due to the Contractor’s operations or by traffic, restore to the specified condition at Contractor’s expense.

END OF SECTION 32 11 23

SECTION 32 12 16 –ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the furnishing and installation of the Hot Mix Asphalt (HMA) base course, HMA leveling course, and HMA surface course.

1.3 REFERENCES

A. Comply with standards in effect as of the date of the Contract Documents except for those having different revision dates as referenced in the codes or as indicated on the Drawings.

B. Except as herein specified or as indicated on the Drawings, the work of this Section shall comply with the following:
   1. ASTM - Current Standards:
      a. D977 - Standard Specification for Emulsified Asphalt.
      b. D979 – Sampling Bituminous Paving Mixtures.
      c. D1188 - Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Paraffin-Coated Specimens.
      d. D2041 – Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixture
      e. D2950 - Test Method for Density of Bituminous Concrete in Place by Nuclear Method.
      f. D2995 - Estimating Application Rate of Bituminous Distributors.
   2. Asphalt Institute (AI):
      a. MS-2 Mix Design Methods.
      b. SP-1 Performance Grade Asphalt Binder Specification and Testing.
      c. IS-210 Procedures for Improving the Precision of HMA Volumetric Calculations.
   3. AASHTO – Current Standards:
      a. M 323 Standard Specification for Superpave Volumetric Mix Design.
      b. MP-1 Superpave Performance-Graded Binder Specification.
      c. MP-15 Use of Recycled Asphalt Shingles as an Additive in HMA Mixtures.
      d. PP-53 Design Considerations When Using Recycled Asphalt Shingles in New HMA Mixtures.
      e. T 245 – Resistance to Plastic Flow of Bituminous Mixtures using a Marshall Apparatus.
      f. T 283 - Moisture Susceptibility of Asphaltic Concrete Mixtures.
      g. T 304 - Uncompacted Void Content of Fine Aggregate, Method A.
      h. T 312: Preparing and Determining the Density of Hot-Mix Asphalt Specimens by Means of the Superpave Gyratory Compactor.
   4. United States Department of Transportation - Federal Highway Administration:
      a. Manual on Uniform Traffic Control Devices (MUTCD).
   5. State DOT Current Standards:
      a. Standard Specifications for Construction.
      b. Standard Plans.
      c. Design Pavement Guidelines
      d. Manual on Uniform Traffic Control Devices.

1.4 SUBMITTALS

A. HMA Mix Design:
   1. Job Mix Formula (JMF) previously approved by state DOT.
      a. Michigan DOT Form 1931
      b. Other States: Submit state DOT form indicating preapproved DOT mix design and required documentation.

2. Job Mix Formula (JMF) not previously approved by state DOT:
   a. Michigan: MDOT 1855 mod form or Form 1911 with regression table.
   b. Other States: Submit DOT or other suitable bituminous mix design communication with all required information to evaluate mix design in accordance with current standards
3. Aggregates:
   a. Source, type, gradation and other required information to evaluate aggregates in accordance with current standards.
   b. Certification that aggregates used in HMA mix meet DOT specifications.

B. Quality Assurance/Control Submittals: Contractor's Quality Control Plan for projects with more than 1,500 tons or greater than 1 day paving

C. Provide a detailed schedule for construction.

1.5 QUALITY ASSURANCE

A. Pre-Paving Meeting:
1. Required for projects greater than 1,500 tons or more than 1 day paving;
2. Optional for projects less than 1,500 tons or 1 day paving.
3. Meeting held at a time mutually agreed upon with Engineer, Owner (optional), Contractor and subcontractors involved in the paving work.
4. Discussion of proposed schedule and methods of accomplishing all phases of the paving work.
5. Minutes distributed to all in attendance.

B. Installation Personnel Qualifications:
1. Trained and experienced in the fabrication and installation of the materials and equipment.
2. Knowledgeable of the design.

C. Testing of HMA Materials:
1. In accordance with Division 01 Section "Testing Services for Buried Utilities, Roadways, and Site Projects."
2. In accordance with approved Contractor's Quality Control Plan.
3. In accordance with all applicable standards.

D. Weight Slips: Furnish weight slips to Engineer, or engineer's representative for material incorporated in the Project to verify that the required tonnage has been applied.

1.6 DELIVERY, STORAGE AND HANDLING

A. Protection: Use all means necessary to protect the materials of this Section before, during, and after installation.

B. Reject damaged, deteriorated or contaminated material and immediately remove from the Site. Replace rejected materials with new materials at no additional cost to Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Reclaimed Asphaltic Materials (RAM):
1. Reclaimed Asphalt Pavement (RAP) and/or Fractionated Reclaimed Asphalt Pavement (FRAP) as percent of total weight of the mixture:
   a. HMA Base: Maximum 35%. State DOT blending requirements; AASHTO M323.
   b. HMA Binder/Leveling: Maximum 25%. Use virgin binder one grade softer, for both high and low temperature, than specified if RAP greater than 20%.
   c. HMA Surface: Maximum 20%. No change in binder selection.
   d. HMA Mixtures With Polymer Asphalt: Maximum 10%.
   e. Greater than 25% RAP/FRAP or Combination: Use virgin asphalt binder grade in accordance with State DOT blending requirements and AASHTO M 323.

2. Reclaimed Asphalt Shingles (RAS):
    a. In accordance with State DOT requirements.
    b. May replace up to 5% of RAP/FRAP component in HMA mixture.
    c. Maximum Particle size = 1/2 inch.
    d. Maximum deleterious materials = 1.5%
3. Bond Coat: SS-1h, CSS-1h.
4. Leveling Course:
    a. HMA Mixture: 3C.
    b. Asphalt Cement PG: 58-28.
    c. Air voids modified to 3% using regression for light traffic applications.
5. Top Course:
    a. HMA Mixture: 4C.
    b. Asphalt Cement PG: 58-28.
    c. Air voids modified to 3% using regression for light traffic applications.

2.2 EQUIPMENT

A. Pavers:
1. Provide an approved self-powered machine capable of spreading and finishing the bituminous mixture to the cross section and grade as indicated on the Drawings.
    a. Supporting wheels, treads, or other devices that ride on the prepared base.
    b. Screeds the full width of the bituminous mixture being applied using an oscillating or vibrating screed.
    c. Equipped with a hopper and an automatic material-depth control device so that each distributing auger and corresponding feeder responds automatically to provide for a constant level of mix ahead of the screed unit to the full width being paved.
2. Provide paver with approved automatic screed control:
    a. System of sensor-operated devices, which follow reference lines or surfaces on one or both sides of the paver.
    b. Adjust speed of the paver to produce the best results.
3. When approved extensions are added to the main screed, provide with the same vibrating screed or tamper action as the main unit of the paver, except for paving variable width areas.
    a. Equip the extensions with a continuation of the automatically controlled spreading augers to within 18 inches of the outside edge of the extension, or as directed.
    b. Provide the main screed and any extensions with an approved method of heat distribution and retention.
4. For Shoulders and Widening:
    a. A self-propelled mechanical spreader capable of maintaining the proper width, depth, and slope without causing segregation of the material.
    b. For base courses up to 10-1/2 feet in width and for leveling and top courses up to 8 feet in width.

B. Rollers:
1. Provide rollers and maintain rolling patterns to achieve required densities to produce a neat, tightly bonded joint that meets surface tolerances
2. Steel-Wheeled Rollers:
    a. Self-propelled, vibratory or static, tandem rollers; or self-propelled static 3-wheeled rollers.
    b. Vibratory Rollers:
        1) Capable of reversing without backlash and equipped with spray attachment for moistening all rollers and scrapers.
        2) Frequency of at least 2,400 vpm and amplitude setting low.
        3) Equipped with a shutoff to deactivate the vibrators when roller speed is less than 0.5 mph and provision to lock in the manufacturer’s recommended speed.
3. Pneumatic-Tired Rollers:
    a. Self-propelled type with a total weight, including ballast, not less than 8 tons nor greater than 30 tons.
    b. Equipped with a minimum of 7 wheels situated on the axles in such a way that the rear group of tires will not follow in the tracks of the forward group, but will be so spaced that a minimum tire path overlap of 1/2-inch is obtained.
    c. Smooth tires capable of being inflated to the pressure recommended by the Manufacturer of the roller or as directed.
    d. Tire Pressures: Maximum variation 5 psi.

PART 3 - EXECUTION

3.1 PREPARATION

A. Test subgrade, subbase or aggregate base for density.
   1. Rework surfaces that have become too wet or dry to provide the required density. Do not pave on wet or saturated aggregates.
   2. Required Density: Minimum 95% of Maximum Density ASTM D1557.

B. Proof or Test Rolling:
   1. Field test the uniformity and stability of the subgrade and subbase.
   2. Loaded dump truck or other approved equipment over entire area in each of 2 perpendicular directions.
   3. Areas indicated or as designated by Engineer or field representative.
   4. In presence of Engineer or field representative.
   5. Repair/undercut unstable or yielding areas as directed.

C. Fine Grading:
   1. Immediately prior to placing paving materials, test the subgrade or aggregate base course for conformity to the elevations and cross-section as indicated on the Drawings.
   2. Fine grade as necessary to bring base course into conformance with the proper elevation and cross-section.
   3. Compact areas which have been re-graded to minimum 95% Maximum Density ASTM D1557.

D. Do not place HMA material until the surface to be paved upon has been inspected and approved by Engineer.

E. Immediately before placing the bituminous material, remove excess loose material remaining on the surface.

3.2 INSTALLATION

A. Weather and Seasonal Limitations:
   1. As required by DOT Construction Specifications.
   2. Do not schedule paving if local radar shows rain in forecast, unless paving can be completed prior to rain event.

B. Transportation of Mixtures
   1. Use trucks that have tight, clean, smooth metal beds from which the entire quantity of the mixture is discharged smoothly into the spreading equipment.
   2. Maintain temperature of the mixture discharge from the hauling unit at the target placement temperature or as directed.
      a. Acceptance Range for HMA at Point of Discharge:
         1) Minimum 250 degrees F to maximum 350 degrees F.
         2) HMA mixes less than 250 degrees F or greater than 350 degrees F at point of discharge:
            a) Do not place mix unless approved by Engineer.
            b) Remove mix from Site and dispose off Site unless approved by Engineer.
            c) No additional cost to project.
      b. If transporting at prevailing temperature below 50 degrees F or when haul times exceed 30 minutes, insulate truck beds and ensure all covers are fastened.
   3. Apply approved release agent to hauling unit to prevent adhesion of the mixture to the bed surface.

C. Placement of the Mixture:
   1. To the fullest extent practicable, spread all mixtures with an asphalt paver.
      a. In areas inaccessible to a paver, mixtures may be spread with a motor grader or mechanical device approved by the Engineer.
      b. Complete placement of each course over the full width of the section under construction on each day's run unless otherwise directed by the Engineer.
   2. Provide a uniformly finished surface at all times, free from tearing or other blemishes that would require hand work.
   3. Spread all mixtures without segregation to the cross sections indicated on the Drawings.

4. When paving ramps or shoulders, or when the grade of a concrete gutter or other existing installation must be met, use the automatic grade reference and slope control devices as directed.
5. Whenever a breakdown or malfunction of the automatic controls occurs, operate the equipment manually for the remainder of the normal working day, provided this method of operation will produce results as required.
6. Coordinate the spreading of the mixture with the required roller coverage, considering the rate of cooling of the mixture as affected by lift thickness and environmental conditions.
7. Coordinate the work such that at the completion of each day's paving operations, all lanes will have been resurfaced to within 1 load of the same point-of-ending.

D. Placing Bituminous Leveling and Top Course Mixtures:
1. Place HMA in lifts not to exceed the maximum application rates as recommended by State DOT for the mixture specified.
2. Place the HMA mixture by an approved self-propelled mechanical paver to such a depth that when compacted, it will have the thickness specified or as directed
3. Adjust the paver to that speed which gives the best results for the type of paver being used and which coordinates satisfactorily with the rate of delivery of the mixture to the paver to provide a uniform rate of placing the mixture without intermittent operation of the paver.
4. When delays result in slowing paving operations such that the temperature of the mat immediately behind the screed falls below 200 degrees F:
    a. Stop paving and place a transverse construction joint.
    b. If the temperature of the mat falls below 190 degrees F prior to any rolling - remove and replace the mat at Contractor's expense.
5. Place the HMA mixture to the required cross section and as indicated on the Drawings.
6. Whenever the temperature of the previously placed mat falls below 170 degrees F prior to placement of the adjacent mat:
    a. Tack coat the vertical edges of the initial mat with bituminous bond coat material before the mixture is placed on the adjacent section.
    b. In placing the mixture adjacent to joints, and rake or broom to provide a dense smooth connection.
7. Connections with existing surfaces at the beginning and ending of resurfacing sections and at intersections.
    a. Construct by feathering out the mix at the rate of approximately 1-inch per 25 feet, unless butt joints are used.
    b. After compaction has been completed, spray the first 3 feet of the joint and 1-foot of area not surfaced with bituminous bond coat, sanded, and rolled.
    c. This work shall be accomplished within the concurrent construction season.
8. If the lanes are being constructed with 2 or more pavers in echelon, match the loose depth of bituminous mixture from each paver at the longitudinal joints.
9. Thickness: In place compacted thickness tested in accordance with ASTM D3549.
    a. Thickness must be within 1/4-inch of specified thickness during both leveling and top course paving.
10. Smoothness requirements: After final rolling, the surface may be tested longitudinally by Engineer using a 10-foot straightedge at selected locations. The variation of the surface from the testing edge for the straightedge between any 2 contacts with the surface shall at no point exceed the following limits:
    a. For HMA Base Course Mixtures:
        1) For Lower Courses: 3/4-inch.
        2) For Top Course: 3/8-inch.
    b. For HMA Leveling and Top Course Mixtures:
        1) Multiple Course Construction: 1/8-inch for top course, 1/4-inch for lower courses.
        2) Single Course Construction: 1/4-inch.
    c. Pavement at castings and valve boxes must be flush or a maximum of 1/4-inch higher than casting. In no case shall casting be higher than pavement.
    d. Any bird bath remaining after 24 hours after a rain event is unacceptable and subject to Engineers direction for remediation. Possible repairs might include saw cut and removal or reheating and rolling pavement to eliminate bird bath.
11. Correct variations in excess of the specified tolerance as directed. Remove and replace pavement as directed by Engineer.
12. Weighing Loads: Each load of bituminous mixture accepted by Engineer shall be weighed to the nearest 20 pounds on an approved scale having an automatic print-out system.
13. Weather and Seasonal Limitations:
    a. Do not place HMA or apply tack/bond coat when precipitation is imminent or when surface moisture will prevent satisfactory curing.

b. Unless otherwise approved by Engineer in writing, temperature requirements for placing HMA mixtures will be in accordance with the table below.
c. HMA paving will not be allowed below minimum temperatures in table or when there is frost on or in the grade or on the existing surface.

Target Placement Temperatures			
Temperature of the Surface Being Overlaid	Rate of Application of Bituminous Material (lbs/square yard)		
	<120	120 to 200	> 200
35 to 39			330 degrees F
40 to 49		330 degrees F	315 degrees F
50 to 59	330 degrees F	315 degrees F	300 degrees F
60 to 69	315 degrees F	300 degrees F	285 degrees F
70 to 79	300 degrees F	285 degrees F	270 degrees F
80 to 89	285 degrees F	270 degrees F	270 degrees F
90 and over	270 degrees F	270 degrees F	270 degrees F

E. Rolling:
1. Compact each layer of HMA to the required density, free of all roller marks.
2. Begin rolling of the HMA mixture as soon after placing as it will bear the roller without undue displacement, picking up the mat, or cracking.
   a. Roll longitudinally at the extreme sides of the lanes and proceed toward the center of the pavement, overlapping on successive trips by at least half the width of the drive wheel of the roller.
   b. Complete alternate passes of the roller using slightly different lengths.
3. Complete the required roller coverage during the period of time in which the temperature of the mixture is sufficient for the roller coverage to be effective in compaction of the mixture.
4. Use tandem steel-wheeled rollers for the final rolling operation on each layer of HMA.
5. Keep surface of steel rollers completely moist with water when rolling.
6. Operate vibratory rollers in the static mode when used for finish rolling or pinching the joint.
7. In Areas Inaccessible to Rollers:
   a. Thoroughly compact the mixture with hot, hand tampers or with mechanical tampers.
   b. Trench rollers or rollers filled with compression strips may be used in depressed areas.

F. Bond or Tack Coat:
1. Clean contact surfaces of sand, dirt, or other objectionable material before applying bond coat.
2. Apply to existing bituminous material and to the vertical edge of the adjacent pavement or curb and gutter, prior to applying new bituminous when:
   a. Paving over milled surface.
   b. Paving over old pavement.
   c. Paving over new pavement.
   d. Adjacent pavement face that is below 170 degrees F.
3. Distributor Vehicle:
   a. Use identical overlapping nozzle spray pattern.
   b. Maintain temperature and pressure that result in a constant uniform application rate.
   c. Provide means for determination of the volume of tack applied to a surface area.
4. Apply tack coat to vertical surfaces and provide uniform application.
5. Application Rate:
   a. 0.05 to 0.1 gallons per square yard for paved surfaces.
   b. Increase application rate 20 to 30% for milled or very rough surfaces.
   c. Increase application rate 50% for vertical edge of adjacent pavement or structure.
   d. Calculate yield by dividing gallons used by square yards covered.
6. Prevent bond or tack coat from coming into contact with structures near the areas to be paved.

7. Allow emulsified asphalt tack coat to break, as indicated by color change from brown to black before HMA paving is placed.
8. Do not place tack coat if local radar shows rain in forecast, unless paving can be completed prior to rain event.

G. Acceptance Density Range:
   1. Low Volume Roads/Parking Lots:
      a. Acceptable Range: 93 to 97% of the TMD.
      b. Average Daily Density: ≥ 94%.
   2. Medium/Heavy Volume Roads:
      a. Acceptable Range: 92 to 96% of the TMD.
      b. Average Daily Density: ≥ 93%.
   3. For smaller projects, the engineer may elect to accept the project without density testing:
      a. Compact all patching, widening, wedging, base, leveling and surface layers of asphalt paving until no further consolidation is visible under the action of the compacting equipment and roller marks are eliminated
      b. Use two or more rollers per paver if placing more than approximately 165 tons of mixture per hour.
      c. Basis of Acceptance: Engineer's visual examination.

H. Construction Joints:
   1. Thoroughly compact all joints to produce a neat, tightly bonded joint that meets surface tolerances and density requirements.
   2. Transverse Joints:
      a. Construct when mixture placement operations are suspended
      b. Thoroughly compact the forward end by rolling before the mixture has cooled.
      c. When work is resumed, vertically cut the end for full depth of the layer unless a formed edge is constructed as approved by the Engineer.
      d. When road must remain open to traffic construct temporary taper before allowing traffic on new surface:
         1) Cut vertical joint and remove excess HMA.
         2) Place burlap, canvas or paper as a bond breaker ahead of and against the vertical face.
         3) Place HMA against the bond breaker and taper from new mat to existing surface.
         4) Extend temporary taper 5 feet for each inch of mat thickness or as directed by Engineer.
         5) Thoroughly compact and cool the temporary taper.
   3. Longitudinal Joints:
      a. Construct parallel to centerline of road.
      b. Multiple Lift Construction: Offset minimum 6 inches from previously placed joint.
      c. Vertical Longitudinal Joint:
         1) Apply uniform tack coat over joint face of existing pavement with a surface temperature less than 170 degrees F.
         2) Place HMA so that it uniformly overlaps the first lane approximately 1 inch
         3) Roll the longitudinal joint from the hot side, 1/2 foot to 1 foot away from the joint for the first pass.
         4) Subsequent Passes: Overlap the cold side by 1/2-foot to 1 foot.
      d. Tapered Overlapping Longitudinal Joint:
         1) Taper the HMA mat at the slope no greater than 1:12.
         2) Extend tapered portion beyond the lane width.
         3) Place 1/2-inch to 1 inch notch at the top of the taper on all courses of paving.
         4) Compact the formed taper section with a weighted roller as wide as the taper.
         5) Apply uniform tack coat to the surface of the taper before the adjacent lane is placed.
      e. Longitudinal Joint Compaction:
         1) Joint Density: Minimum 90% TMD (G_{mm}).
         2) Joint Density with echelon paving; same as adjacent mat.

3.3 CLEANING

A. Prior to acceptance of the work, clean the pavement and related areas to remove dirt and stones.

END OF SECTION 32 12 16

SECTION 32 13 14 – CONCRETE WALKS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the furnishing and installation of concrete walks.

1.3 REFERENCES

A. Except as herein specified or as indicated on the Drawings, the work of this Section shall comply with the following:
   1. ASTM Publications:
      a. A820 - Steel Fibers for Fiber Reinforced Concrete.
      b. C33 - Specification for Concrete Aggregates.
      c. C39 - Test Method for Compressive Strength of Cylindrical Concrete Specimens.
      d. C94 - Specification for Ready-Mixed Concrete.
      e. C136 - Sieve Analysis of Fine and Coarse Aggregates.
      f. C150 - Specification for Portland Cement.
      g. C260 - Specification for Air-Entraining Admixtures for Concrete.
      h. C309 - Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
      i. C330 - Specification for Lightweight Aggregates for Structural Concrete.
      j. C494 - Specification for Chemical Admixtures for Concrete.
      k. C595 – Specification for Blended Hydraulic Cements.
      l. C618 - Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.
   2. ACI – American Concrete Institute:
      a. 117 - Standard Tolerances for Concrete Construction and Materials.
      b. 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete.
      c. 302.1R - Guide for Concrete Floor and Slab Construction.
      d. 303R - Guide to Cast-In-Place Architectural Concrete Practice.
      e. 304R - Guide for Measuring, Mixing, Transporting and Placing Concrete.
      f. 305R - Hot Weather Concreting.
      g. 306R - Cold Weather Concreting.
      h. 309R - Guide for Consolidation of Concrete.
   3. Americans with Disabilities Act (ADA).

1.4 SUBMITTALS

A. Action Submittals:
   1. Provide mix design for concrete to be supplied.
      a. Include quantities and sources of all aggregates, cement, cementitious materials, and admixtures to be used.
      b. Submitted from a state DOT certified testing laboratory regularly engaged in designing and testing concrete for exterior paving.
      c. Use test results for mix design from within the past 12 months.
   2. Product Data: Submit Manufacturer’s product data with application and installation instructions for admixtures, curing compounds, expansion joint fillers and sealants.
   3. Alkali-Silica Reactivity (ASR):
      a. Submit to Engineer ASTM C1260 Accelerated mortar bar test, and ASTM C1293 Concrete prism expansion for ASR from aggregate supplier.
      b. Documentation may include previous testing (within previous 2 years) of materials and sources intended for use.
      c. Documentation may include previous testing (within previous 2 years) from other projects or records provided by the material suppliers.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cement:
1. Portland cement, ASTM C150, Type I or I/II , or Type IL in accordance with ASTM C595.
2. Do not use different types of cement, different manufacturers of cement, or different degrees of fineness.

B. Cementitious Materials or Cement Substitutes:
1. Fly Ash: ASTM C618, Class C or F.
2. Ground Granulated Blast Furnace Slag (GGBFS):
   a. ASTM C989 Grade 100 minimum.
   b. Use only as a blending material with Type I or Type IA Portland cement.
3. Silica Fume, Dry-Densified:
   a. ASTM C1240.
   b. Use only as a blending material with Type I or Type IA Portland cement.
4. Reduce the cement quantity up to a maximum of 25% for fly ash substitution or up to 40% for GGBFS substitution.
5. Fly ash or GGBFS weight additions must equal the weight of the cement reduction.
6. For concrete containing Portland cement, fly ash and GGBFS in the same mix design, reduce the cement quantity up to 40%, with the maximum fly ash quantity not exceeding 15%.

C. Aggregates:
1. Grade aggregates according to procedures of ASTM C136, Class M, Exposure 4.
2. Coarse Aggregates: ASTM C33-5S, Number 57 (1-inch), crushed limestone.
3. Fine Aggregate: ASTM C33.
4. Test all aggregates for alkali-silica reactivity and provide mitigation method, if required.

D. Water: Clean, fresh and potable.

E. Admixtures:
1. General:
   a. No admixture shall contain more than 0.1% water soluble chloride ions by mass of cementitious material.
   b. No admixture shall contain calcium chloride.
2. Air-Entraining:
   a. Comply with ASTM C260.
   b. Daravair series or Darex series, by W.R. Grace & Company; Micro Air, by BASF Admixtures, Inc.; or equal.

F. Curing Agents:
1. Curing agents shall comply with ASTM C309.
2. Provide approved products by Symons Corporation, W.R. Meadows, L & M Chemical, Master Builders or Dayton-Superior which are compatible with floor coatings or toppings specified.
3. Compounds:
   a. Curing:
      1) 1600 White by W.R. Meadows.
      2) Day-Chem Rez Cure (J-11-W) by Dayton Superior.
      3) Resi-Chem Clear Cure by Symons.
      4) Confilm by Master Builders.
      5) L & M Cure by L & M Chemical.

2.2 CONCRETE MIX DESIGN

A. Design mix to project normal-weight concrete consisting of Portland cement aggregate, air-entrained add mixture and water producing the following properties:
1. Compressive Strength: 3,500 psi (min) at 28 days.
2. Air Content: 5.5% to 8.0%
3. Slump: 0 to 3 inches unless mid-range water reducer is used then slump may 6 inches Water Cement Ratio: 0.5 maximum.

B. Alkali-Silica Reactivity (ASR):
   1. The Concrete supplier is required to evaluate the fine aggregates (only) used in the production of the concrete for ASR.
   2. Submit to the Engineer ASTM C1260 Accelerated mortar bar test for ASR from the aggregate supplier.
   3. Submit to the Engineer ASTM C1293 concrete prism expansion for ASR from the aggregate supplier if available, or if necessary.
   4. Documentation may include previous testing of materials so long as material source has not changed, and test is not more than 2 years old.
   5. No ASR mitigation is required if aggregates are non-reactive where ASTM C1260 accelerated mortar bar test expansion is less than 0.10% at 14 days, or if ASTM C1293 Concrete prism expansion is less than 0.04% at 1 year.
   6. If ASTM C1260 mortar bar test results is more than 0.10% expansion at 14 days, ASTM C1293 concrete prism test is required to be performed before aggregates can be used.
   7. ASR mitigation is required if aggregates are found to be moderately reactive where ASTM C1293 Concrete prism expansion is equal to or greater than 0.04%, but less than 0.12% at 1 year.
   8. Aggregates will not be accepted if ASTM C1293 Concrete prism expansion is equal to or greater than 0.12% at 1 year.

C. Mitigation Methods for Moderately Reactive Aggregates:
   1. In accordance with DOT approved Specifications.
   2. Use low Alkali Cements:
      a. Submit mill test report data and calculations for Cement and Fly ash.
      b. Maximum Alkali content of cementitious materials (cement and fly ash) (Na2Oe) (Na2O equivalent) ≤ 3.5 lbs/cyd.
      c. Maximum Alkali content in cement (Na2Oe) (Na2O equivalent) ≤ 0.7%.
      d. Maximum lime CaO in Fly ash ≤ 20%.
      e. Minimum Silica in Fly ash SiO_2 ≥ 35%.
      f. Total oxides in Fly ash (SiO_2 + Al_2O_3 + Fe_2O_3) ≥ 60%.
   3. Demonstrate the effectiveness of the proposed mix combination to resist the potential for excessive expansion caused by ASR using current and historic data:
      a. ASTM C1567 (14 day test) using both coarse and fine aggregate and all cementitious materials.
      b. Mortar bars constructed of cementitious materials and coarse and fine aggregates must produce an expansion of less than 0.10%.

2.3 DETECTABLE/TACTILE WARNING SURFACES

A. Furnish and install tactile surface plate into uncured concrete cement.
   1. In accordance with most current Americans With Disabilities Act (ADA).
   2. Materials:
      a. Vitrified Polymer Composite (VPC), cast-in-place surface tile.
      b. Cast iron warning plate.
   3. Manufacturers:
      a. VFC: Armor Tile, ADA Solutions.
   4. Color:
      a. Brick Red (Color No. 22144).
   5. Plates must be radial to match curb radius when indicated on the Drawings.

2.4 FORM WORK

A. Provide necessary form work to provide concrete dimensions indicated on the Drawings ±1/2 inch.
   1. Forms to be straight and true, minimum 1 5/8-inch thick wood, full depth of concrete or steel forms.
   2. All curved radius pours to be smooth deflectable steel.

2.5 EXPANSION JOINTS

A. Joint fiber shall be pre formed, composed of either blended, bonded flexible and waterproof fiber meeting the requirements of AASHTO M213 or polyvinyl chloride with fabric strand.

B. Reinforcement: Proflex by Oscoda Plastics; or approved equal.

C. Full depth of concrete.

2.6 SEALANTS

A. Joint sealant to be gray elastomeric silicone or polyurethane sealant conforming to ASTM 920: Sonoborn SL-2; or equal.

PART 3 - EXECUTION

3.1 GRADING

A. Provide smooth base of granular material compacted to 95% of its maximum density in accordance with ASTM D1557.

3.2 INSTALLATION

A. Weather and Temperature Limitations:
   1. Do not place concrete when the temperature of the air is at or expected to drop below 40 degrees F for at least 7 days after placing.
   2. Do not place concrete if portions of the base, subbase, or subgrade layer are frozen, or if the grade exhibits poor stability from excessive moisture levels.
   3. Do not place concrete when the temperature of the air is above or expected to exceed 85 degrees F for at least 7 days after placing.

B. Cold Weather Concrete Operations:
   1. Comply with the recommendations of ACI 306R.
   2. Recommended Protective Measures:
      a. Heating materials.
      b. Providing insulating blankets and windbreaks.
      c. Heated enclosures.
   3. Advise Engineer of planned protective measures.
   4. Straw or similar materials shall not be allowed.
   5. Do not use frozen materials or materials containing ice or snow.
   6. Do not place concrete on frozen subgrade.

C. Hot Weather Concrete Operations:
   1. Comply with the recommendations of ACI 305R.
   2. Recommended Protective Measures:
      a. Cooling materials.
      b. Concrete placement during cooler hours of the day.
      c. Providing shading and windbreaks.
   3. Advise Engineer of planned protective measures.

D. Slope:
   1. All walks should have a cross slope of a minimum 1% and maximum 2% sloped toward a curb or lower elevation.
   2. No walks should exceed 5% longitudinal slope.

E. Preparation of Base:
   1. Excavate to the required depth and to a width that will permit forming.
   2. Remove unsuitable material below the required depth and replace with sound earth.
   3. Shape and compact the base to conform to the section indicated on the Drawings.

F. Forms:
   1. Use fixed forms.
   2. Apply form releasing agent to prevent concrete from bonding to forms.
   3. Provide straight, full depth forms free of warp and strong enough to resist springing during concrete placement.
   4. Firmly stake fixed forms to prohibit movement.

G. Reinforcing: Reinforce all concrete walks with welded wire fabric pulled up 2 inches into concrete.

H. Placing and Finishing Concrete:
   1. Place all concrete in accordance with ACI 304R and ACI 304.2R.
   2. Moisten base before placing concrete.
   3. Place concrete and consolidate, including along the faces of the forms, before finishing.
   4. Place and finish in a continuous operation.
   5. When replacing gutters along with concrete walk ramps, construct the gutter to the same dimensions and profile and use the same reinforcement pattern as the existing gutter.
   6. Float the surface just enough to produce a smooth surface free from irregularities.
   7. Round edges and joints with an approved finishing tool.
   8. Broom finish concrete walks and ramps by drawing a fine-hair broom across the concrete surface, perpendicular to the line of traffic. Repeat operation if required to provide a fine line texture acceptable to the Engineer.

I. Joints:
   1. General: Comply with ACI 318-6.3, 6.4, and ACI 301, Section 6. Construct expansion, weakened-plane (contraction), and construction joints true-to-line with face perpendicular to surface of concrete. Construct transverse joints at right angles to the centerline, unless otherwise indicated.
   2. Weakened-Plane (Contraction) Joints: Provide weakened-plane (contraction) joints, sectioning concrete into areas as indicated on the Drawings. Contraction joints for curbs shall be provided at 10 foot intervals and 20 foot spacing for slabs, unless shown otherwise. Construct weakened plane joints for a depth equal to at least 1/4 concrete thickness, as follows:
      a. Tooled Joints: Form weakened-plane joints in fresh concrete by grooving top portion with a recommended cutting tool and finishing edges with a jointer.
      b. Sawed Joints: Form weakened-plane joints using powered saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut joints into hardened concrete as soon as surface will not be torn, abraded, or otherwise damaged by cutting action.
   3. Construction Joints: Place construction joints at end of placements and at locations where placement operations are stopped for a period of more than 1/2 hour, except where such placements terminate at expansion joints.
   4. Expansion Joints: Provide premolded joint filler for expansion joints abutting concrete curbs, catch basins, manholes, inlets, structures, walks and other fixed objects, unless otherwise indicated. Locate expansion joints at 100 feet on center along linear lengths of curb and walks, and at points of radii of curbs unless otherwise indicated.
   5. Extend joint fillers full width and depth of joint, and not less than 1/2 inch or more than 1 inch below finished surface for joint sealant.
   6. Furnish joint fillers in one-piece lengths for full width being placed, wherever possible. Where more than 1 length is required, lace or clip joint filler sections together.

J. Thickness: Except as otherwise specified or indicated on the Drawings, provide a minimum thickness of 4 inches.

K. Where walkways cross driveways, provide a minimum thickness of 6 inches.

L. Ramps:
   1. As indicated on the Drawings.
   2. No ramp shall exceed 1:12 slope.
   3. Place detectable warning domed plates in fresh concrete in accordance with Manufacturer’s instructions on ramp surface.
   4. ADA domes to be 24 inches wide, full width of ramp.

M. Backfilling:
   1. After the concrete has gained sufficient strength, remove fixed forms and backfill with sound earth.
   2. Compact and level the backfill 1-inch below the surface of the concrete.

3.3 CONCRETE FINISHING

A. After striking-off and consolidating concrete, smooth surface by screening and floating. Use hand method only where mechanical floating is not possible. Adjust floating to compact surface and produce uniform texture.

B. After floating, test surface for trueness with a 10 foot straightedge. Distribute concrete as required to remove surface irregularities, and refloat repaired areas to provide a continuous smooth finish.

C. Work edges of slabs, and formed joints with an edging tool, and round to 1/2 inch radius, unless otherwise indicated. Eliminate tool marks on concrete surface.

D. After completion of floating and troweling when excess moisture or surface sheen has disappeared, complete surface finishing, as follows:
   1. Exterior slabs, sidewalks, flow channels, flumes, curbs, and other similar concrete pavement types shall have a non-slip finish by scoring the surface with a fine-hair broom, perpendicular to the line of traffic. Repeat operation if required to provide a fine line texture acceptable to the Engineer.
   2. Retaining walls, wing walls, light pole bases, and other surfaces exposed to view upon completion of work shall be given a rubbed finish as specified below:
      a. Immediately upon removal of the forms, the surfaces to be rubbed shall be pointed up, thoroughly wetted and then rubbed with a No. 20 carborundum brick and water so as to produce a true, even, and smooth surface. When necessary to fill pinholes, and upon areas which have been reconstructed, rubbing shall be done by carborundum brick and a thin cement grout composed of 1 part of cement and 2 parts of fine washed silicone sand, all of which shall pass a No. 20 sieve. The surfaces finished with grout shall be carefully scraped with a steel edge so as to remove all surplus grout, after which it shall be given a final rub with a wood float until all skin and form marks shall be removed. No "wash" composed of cement and water, or cement, sand and water shall be used in this process.

E. Do not remove forms for 24 hours after concrete has been placed. After form removal, clean ends of joints and point-up any minor honeycombed areas. Remove and replace areas or sections with major defects, as directed by Engineer.

3.4 CURING

A. General:
   1. After texturing operations have been completed and after the free water has left the surface, coat the concrete walk surface and sides of slip-formed concrete walks with a uniform layer of membrane curing compound.
   2. Apply 1 coat of curing compound on non-grooved (broomed) surfaces and 2 coats on grooved (raked) surfaces.
   3. Apply not less than 1 gallon per 25 square yards of concrete for each application.
   4. Apply the second coat after the first has dried sufficiently but do not exceed 2 hours between coats.
   5. Keep the compound thoroughly mixed according to the Manufacturer’s recommendations.
   6. Do not thin curing compound.
   7. Reapply curing compound immediately to surfaces damaged by rain, joint sawing, foot traffic or other activities.
   8. If fixed forms are removed during the curing period, coat the entire area of the sides of the concrete walk with curing compound immediately after removal of forms.

B. These requirements are minimum requirements only. Repair or replacement of concrete showing damage due to inadequate curing is required. All costs associated with this corrective work will be borne by the Contractor.

3.5 ADA TRUNCATED DOMES

A. Prior to installation, review mix design with concrete supplier and installer to ensure concrete has proper slump and will not set too rapidly to allow for proper installation.

B. Install system in accordance with Manufacturer’s specifications and recommendations. Dome panels to be perpendicular and parallel with curb with no gaps between panels. Panels must be level and flush with adjacent concrete walk. Installation must be acceptable to Engineer or removed and replaced at Contractor’s expense.

C. Install top of domes flush with top of adjacent concrete along top and sides of plates. Install bottom of domes flush with concrete at lower end of plates.

3.6 PROTECTION

A. Protect the walks from damage until acceptance of the Work.

B. Protect the concrete from freezing until the concrete has attained a compressive strength of at least 1000 psi.

C. Maintain walks as clean as practical by removing surface stains and spillage of materials as they occur.

D. Sweep concrete walks and wash free of stains, discolorations, dirt and other foreign material just prior to final inspection.

3.7 DEFECTIVE WORK

A. The following list of deficiencies shall be considered defective work and shall be replaced by the Contractor at no cost to the Owner:
   1. Difference in elevation between panels of 1/2-inch or greater.
   2. Cracks of any length that are 1/8-inch wide or wider.
   3. Surface spalling covering in excess of 20% of the area of any 1 panel.
   4. A hole that is 1/2-inch or greater in depth and 2 inches or greater in diameter.
   5. Residual splatter that is 1/2-inch or higher and attached to a panel.
   6. Elevation difference of 3/4-inch in 10 feet caused by settling, that has not caused an elevation difference between panels.
   7. Multiple hairline cracking.
   8. Footprints, bike tire tracks, animal tracks, or the like, created while concrete was not cured.
   9. Improperly install tactile warning surface.
   10. ASR cracking or potholing.

3.8 CLEAN-UP

A. For duration of work, Contractor is to maintain work area free of waste material, debris, and the like.
   1. Contractor shall provide on-site containers as necessary for work of this Section. Locate as directed by Engineer.

B. Upon completion and when directed by Engineer, Contractor shall remove all excess material, debris, and equipment occasioned by the work.

END OF SECTION 32 13 14

SECTION 32 16 13 – CONCRETE CURBS AND GUTTERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the furnishing and installation of concrete curbs and gutters.

1.3 REFERENCES

A. Except as herein specified or as indicated on the Drawings, the work of this Section shall comply with the following:
   1. ASTM Publications:
      a. A820 - Steel Fibers for Fiber Reinforced Concrete.
      b. C33 - Specification for Concrete Aggregates.
      c. C39 - Test Method for Compressive Strength of Cylindrical Concrete Specimens.
      d. C94 - Specification for Ready-Mixed Concrete.
      e. C136 - Sieve Analysis of Fine and Coarse Aggregates.
      f. C150 - Specification for Portland Cement.
      g. C260 - Specification for Air-Entraining Admixtures for Concrete.
      h. C309 - Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
      i. C330 - Specification for Lightweight Aggregates for Structural Concrete.
      j. C494 - Specification for Chemical Admixtures for Concrete.
      k. C595 – Specification for Blended Hydraulic Cements.
      l. C618 - Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.
   2. ACI – American Concrete Institute:
      a. 117 - Standard Tolerances for Concrete Construction and Materials.
      b. 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete.
      c. 302.1R - Guide for Concrete Floor and Slab Construction.
      d. 303R - Guide to Cast-In-Place Architectural Concrete Practice.
      e. 304R - Guide for Measuring, Mixing, Transporting and Placing Concrete.
      f. 305R - Hot Weather Concreting.
      g. 306R - Cold Weather Concreting.
      h. 309R - Guide for Consolidation of Concrete.

1.4 SUBMITTALS

A. Action Submittals: Provide mix design for concrete to be supplied.

1.5 QUALITY ASSURANCE

A. Testing: Testing will be performed in accordance with Division 01 Section "Testing Services for Buried Utilities, Roadways, and Site Projects" and the Contractor’s Quality Control Plan.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cement:
   1. Portland cement, ASTM C150, Type I or I/II , or Type IL in accordance with ASTM C595.
   2. Do not use different types of cement, different manufacturers of cement, or different degrees of fineness.

B. Fly Ash: ASTM C618, Class C.

C. Aggregates:
   1. Grade aggregates according to procedures of ASTM C136, Class M, Exposure 4.
   2. Coarse Aggregates: ASTM C33-5S, Number 57 (1-inch), crushed limestone.
   3. Fine Aggregate: ASTM C33.

D. Water: Clean, fresh and potable.

E. Admixtures:
   1. General:
      a. No admixture shall contain more than 0.1% water soluble chloride ions by mass of cementitious material.
      b. No admixture shall contain calcium chloride.
   2. Air-Entraining:
      a. Comply with ASTM C260.
      b. Daravair series or Darex series, by W.R. Grace & Company; Micro Air, by BASF Admixtures, Inc.; or equal.

F. Curing Agents:
   1. Curing agents shall comply with ASTM C309, Type 2 white.
   2. Provide approved products by Symons Corporation, W.R. Meadows, L & M Chemical, Master Builders or Dayton-Superior:
      a. 1600 White by W.R. Meadows.
      b. Day-Chem Rez Cure (J-11-W) by Dayton Superior.
      c. Resi-Chem Clear Cure by Symons.
      d. Confilm by Master Builders.
      e. L & M Cure by L & M Chemical.

G. Concrete Reinforcement:
   1. Deformed reinforcing bars.
   2. ASTM A615, Fy = 60,000 psi.
   3. Required only when indicated on the Drawings.

2.2 CONCRETE MIX DESIGN

A. Design mix to project normal-weight concrete consisting of Portland cement aggregate, air-entrained add mixture and water producing the following properties:
   1. Compressive Strength: 3,500 psi (min) at 28 days.
   2. Air Content: 5.5% to 8,0%.
   3. Slump: 0 to 3 inches unless mid-range water reducer is used then slump may 6 inches.
   4. Water Cement Ratio: 0.5 maximum.

2.3 FORMWORK

A. Provide necessary formwork to provide concrete dimensions indicated on the Drawings ±1/2 inch.
   1. Forms to be straight and true, minimum 1 5/8-inch thick wood, full depth of concrete or steel forms.
   2. All curved radius pours to be smooth deflectable steel.

2.4 EXPANSION JOINTS

A. Joint fiber shall be preformed, composed of either blended, bonded flexible and waterproof fiber meeting the requirements of AASHTO M213 or polyvinyl chloride with fabric strand or ASTM D1751 fiber joint filler.

PART 3 - EXECUTION

3.1 GRADING

A. Provide smooth base of granular material compacted to 95% of its maximum density in accordance with ASTM D1557.

3.2 INSTALLATION

A. Weather and Temperature Limitations:
   1. Do not place concrete when the temperature of the air is at or expected to drop below 40 degrees F for at least 7 days after placing.
   2. Do not place concrete if portions of the base, subbase, or subgrade layer are frozen, or if the grade exhibits poor stability from excessive moisture levels.
   3. Do not place concrete when the temperature of the air is above or expected to exceed 85 degrees F for at least 7 days after placing.

B. Cold Weather Concrete Operations:
   1. Comply with the recommendations of ACI 306R.
   2. Recommended Protective Measures:
      a. Heating materials.
      b. Providing insulating blankets and windbreaks.
      c. Heated enclosures.
   3. Advise Engineer of planned protective measures.
   4. Straw or similar materials shall not be allowed.
   5. Do not use frozen materials or materials containing ice or snow.
   6. Do not place concrete on frozen subgrade.

C. Hot Weather Concrete Operations:
   1. Comply with the recommendations of ACI 305R.
   2. Recommended Protective Measures:
      a. Cooling materials.
      b. Concrete placement during cooler hours of the day.
      c. Providing shading and windbreaks.
   3. Advise Engineer of planned protective measures.

D. Preparation of Base:
   1. Excavate to the required depth and to a width that will permit forming.
   2. Remove unsuitable material below the required depth and replace with sound earth.
   3. Shape and compact the base to conform to the section indicated on the Drawings.

E. Forms:
   1. Use fixed forms.
   2. Apply form releasing agent to prevent concrete from bonding to forms.
   3. Provide straight, full depth forms free of warp and strong enough to resist springing during concrete placement.
   4. Firmly stake fixed forms to prohibit movement.

F. Reinforcing:
   1. Place reinforcement in accordance with CRSI placing reinforcement bars and Manual of Standard Practice.
   2. Tolerances indicated in ACI 117.
   3. 3-inch minimum cover.

G. Placing and Finishing Concrete:
   1. Place all concrete in accordance with ACI 304R and ACI 304.2R.
   2. Moisten base before placing concrete.
   3. Place concrete and consolidate, including along the faces of the forms, before finishing.

4. Place and finish in a continuous operation.
5. When replacing gutters along with concrete walk ramps, construct the gutter to the same dimensions and profile and use the same reinforcement pattern as the existing gutter.
6. Float the surface just enough to produce a smooth surface free from irregularities.
7. Round edges and joints with an approved finishing tool.

H. Joints:
1. General: Comply with ACI 318-6.3, 6.4, and ACI 301, Section 6. Construct expansion, weakened-plane (contraction), and construction joints true-to-line with face perpendicular to the centerline, unless otherwise indicated on the Drawings.
2. Weakened-Plane (Contraction) Joints: Provide weakened-plane (contraction) joints, sectioning concrete into areas as indicated on the Drawings. Contraction joints for curbs shall be 1-1/2 inch deep provided at 10 foot intervals unless indicated otherwise on the Drawings.
3. Construction Joints: Place construction joints at end of placements and at locations where placement operations are stopped for a period of more than 1/2 hour, except where such placements terminate at expansion joints.
4. Install expansion joints at the spring point of curves of all radius curbs. For curbed islands install 2 expansion joints at opposite ends of island at spring points.
5. Install expansion joints 10 feet either side of catch basins, and every 300 feet longitudinally.

I. Backfilling:
1. After the concrete has gained sufficient strength, remove fixed forms and backfill with sound earth.
2. Compact and level the backfill 1-inch below the surface of the concrete.

3.3 CONCRETE FINISHING

A. After striking-off and consolidating concrete, smooth surface by screening and floating. Use hand method only where mechanical floating is not possible. Adjust floating to compact surface and produce uniform texture.

B. After floating, test surface for trueness with a 10 foot straightedge. Distribute concrete as required to remove surface irregularities, and refloat repaired areas to provide a continuous smooth finish.

C. After completion of floating and troweling when excess moisture or surface sheen has disappeared, complete surface finishing to create a non-slip finish by scoring the surface with a fine-hair broom, perpendicular to the line of traffic. Repeat operation if required to provide a fine line texture acceptable to the Engineer. Finish edges with 1/2-inch radius.

D. Do not remove forms for 24-hours after concrete has been placed. After form removal, clean ends of joints and point-up any minor honeycombed areas. Remove and replace areas or sections with major defects, as directed by the Engineer.

3.4 CURING

A. General: After texturing operations have been completed and after the free water has left the surface, coat the concrete with 1 coat of a uniform layer of membrane curing compound.

3.5 PROTECTION

A. Protect from damage until acceptance of the Work.

B. Protect the concrete from freezing until the concrete has attained a compressive strength of at least 1000 psi.

C. Maintain as clean as practical by removing surface stains and spillage of materials as they occur.

3.6 FIELD QUALITY CONTROL

A. The following list of deficiencies shall be considered defective work if found within 1 year of installation, and shall be replaced by the Contractor at no cost to the Owner:
   1. Gutters that pond more than 1/4-inch of water.
   2. Cracks of any length that are 1/8-inch wide or wider.
   3. A hole that is 1/2-inch or greater in depth and 2 inches or greater in diameter.
   4. Residual splatter that is 1/2-inch or higher than adjacent concrete.
   5. Elevation difference of 1/4-inch in 10 feet caused by settling or improper forming.
   6. Footprints, bike tire tracks, animal tracks, or the like, created while concrete was not cured.

3.7 CLEANING

A. Maintain work area free of waste, material and debris.

END OF SECTION 32 16 13

SECTION 32 17 23 –PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes parking lot and roadway striping consisting of providing and applying retroreflective permanent pavement markings in accordance with the Manual on Uniform Traffic Control Devices. Provide markings, shapes, spacing, and dimensions that conform to the State DOT Pavement Marking Standard Plans.

1.3 REFERENCES

A. Comply with standards in effect as of the date of the Contract Documents except for those having different revision dates as referenced in the codes or as indicated on the Drawings.

B. Except as herein specified or as indicated on the Drawings, the work of this Section shall comply with the following:
   1. TT-P-1952D, Federal Specification: Paint, Traffic and Airfield Marking, Waterborne.
   2. United States Department of Transportation - Federal Highway Administration:
      a. Manual on Uniform Traffic Control Devices (MUTCD).
   3. State DOT Current Standards:
      a. Manual on Uniform Traffic Control Devices.

1.4 SUBMITTALS

A. Product Data:
   1. Provide a detailed schedule for construction.
   2. Provide manufacturer data sheet on each material to be used.

1.5 QUALITY ASSURANCE

A. Installation Personnel Qualifications:
   1. Trained and experienced in the fabrication and installation of the materials and equipment.
   2. Knowledgeable of the design.

1.6 DELIVERY, STORAGE AND HANDLING

A. Protection: Use all means necessary to protect the materials of this Section before, during, and after installation.

B. Reject damaged, deteriorated or contaminated material and immediately remove from the Site. Replace rejected materials with new materials at no additional cost to Owner.

PART 2 - PRODUCTS

2.1 PAVEMENT MARKINGS

A. Marking paint shall meet Federal Specification GSA-FSSTT-P-115E Type 1.

B. Size and Color: 6-inch width, white, yellow, blue or other color depending on intended use.
   1. As indicated on the Drawings.
   2. In accordance with guidelines, State MUTCD and FHWA – MUTCD.

C. Materials to be Used:
   1. Road Striping: Waterborne.
   2. Road Stop Bars: Thermoplastic or Cold Plastic.

D. Traffic paint shall be spray type for stripe marking. Contractor may use one of the following, or equal:
   1. Repcolite:
      a. 47610 Traffic Marking Paint; White.
      b. 47660 Traffic Marking Paint; Yellow.
      c. 47630 Traffic Marking Paint (Barrier Free Blue).
   2. Sherwin Williams:
      a. Setfast Low VOC Acrylic Traffic Marking Paint; TM 5626 (White), TM 5627 (Yellow).
      b. Smart Mark Premium Alkyd Thermoplastic.
      c. Smart Mark Premium Hydro Thermoplastic.
   3. Epoplex: LS90 Polyurea liquid pavement marking system.

E. Thickness (mil) For Single Application:
   1. Waterborne: 15 mil (110 sq. ft./gallon).
   2. Thermoplastic: 90 mil.
   3. Polyurea: 20 mil.

F. If the Contract requires a second application of permanent pavement markings, complete 2 applications regardless of initial pavement marking conditions. Complete the second application from 14 days to 60 days after initial application in the same calendar year.

G. Apply the second application before the required 14 days if previously approved by the Engineer.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare as indicated on the Drawings for layout of pavement markings, symbols, and all associated dimensions, details and requirements.

B. Measure pavement and mark pavement marking locations with chalk lines on parking lots or grease pencil to be sure all dimensions comply with the Drawings.

C. Before applying pavement markings, ensure the pavement surface is clean, dry and in sound condition. Remove any dust, oil, grease, dirt, loose rust and other foreign material. Air blast to remove material that prevents pavement markings from adhering to the pavement surface.

D. Apply longitudinal lines with certified self-propelled pavement marking equipment. Contact the Engineer for approval of using other equipment for special markings or areas inaccessible to self-propelled pavement marking equipment.

E. Provide self-propelled equipment certified with the Equipment Certification Guidelines for Pavement Markings. Certification is effective for 2 years. Operate marking equipment at no greater than the certified speed.

F. Use equipment capable of uniformly applying material to the required length and width. Provide equipment for placing centerlines, capable of applying a minimum of three 4-inch lines on a two-lane road in one pass. If applying multiple centerlines, use 3 spray guns positioned 6 inches on center. For two lane freeways, apply the lane line from the left lane.

G. Use equipment for placing hot-applied thermoplastic and sprayable thermoplastic material that can maintain the temperature recommended by the material manufacturer.

H. Prepare new and existing hot mix asphalt (HMA) surfaces open to traffic for 10 days or less with no oil drips, residue, debris, or temporary or permanent markings, by cleaning the marking area with compressed air.

I. Prepare new and existing Portland Cement Concrete (PCC) surfaces free of oil drips, residue, and debris, temporary, or permanent markings, by removing the curing compound from the area required for pavement markings.

J. Prepare existing HMA or PCC surfaces that do not have existing markings, but may have oil drip areas, or both, by scarifying the marking area using non-milling grinding teeth or shot blasting. Use of water blasting to scarify the marking area on PCC surfaces is allowed.

3.2 PAVEMENT MARKING

A. Apply pavement marking in accordance with state DOT and FHWA requirements.

B. For solid lines, apply 4 inch and 6 inch lines, no greater than 1/4 inch wider than the required width. Apply solid lines with no gaps or spaces. Apply a double line as either 2 solid lines or 1 solid line and 1 broken line.

C. Mix liquid materials during application. Do not thin materials. Uniformly apply pavement marking material at the rates indicated by the manufacturer.

D. Operate striping equipment to prevent traffic from crossing the uncured markings. Prevent vehicles from being sprayed.

E. Apply sharp, well-defined markings, free of uneven edges, overspray, or other visible defects, as determined by the Engineer. Ensure pavement marking lines are straight, or of uniform curvature. Pavement markings are subject to inspection by the Engineer. Remove pavement markings outside the required tolerances and re apply in the correct locations. Also re apply unprotected pavement markings damaged by traffic and remove tracked lines at no additional cost to the Owner.

F. Ensure the material application rates, the temperature and seasonal application restrictions listed in the Table after Paragraph 2.1 G. Also ensure the additional requirements indicated in this Article for specific materials are met when applying any material, unless directed by the Engineer.

G. Protect pavement marking from traffic crossing over uncured paint.

H. Re apply lines washed away or otherwise damaged by rain at no additional cost to the Owner.

I. Regular Dry Paint: Wait at least 14 days after placing the pavement surface before applying regular dry pavement markings to new HMA wearing surface. The Engineer may consider waiving the 14 day waiting period if conditions dictate.

J. Cold Plastic:
1. Prepare the pavement surface and apply the cold plastic tape in accordance with the manufacturer's specifications.
2. Remove curing compound from new concrete surfaces before applying cold plastic tape.
3. Install cold plastic tape legends, crosswalks, and stop bars, as shown on the standard plan requirements, unless otherwise required in the Drawings.

K. Primerless – Without Surface Preparation Adhesive:
1. Ensure dry weather for at least 24 hours, and dry pavement surface before applying the primerless cold plastic tape marking. Clean the pavement surface using an air compressor with at least 185 cfm air flow and 120 psi.
2. Immediately after placement, roll transverse and special markings at least 6 times with a roller weighing at least 200 pounds.

L. Thermoplastic:
1. It is the Contractor's responsibility to ensure the pavement is free of excess surface and subsurface moisture that may affect bonding.
2. Heat and apply the thermoplastic material within the temperature range recommended by the manufacturer.
3. Heat and apply the sprayable thermoplastic material within the temperature range recommended by the manufacturer.

M. Polyurea:
   1. Ensure the pavement is free of excess surface and subsurface moisture that may affect bonding.
   2. Surface preparation requirements for special, and longitudinal polyuria pavement markings depend on surface conditions.

3.3 CLEANING

A. Prior to acceptance of the work, clean the pavement and related areas to remove dirt and stones.

END OF SECTION 32 17 23

SECTION 32 90 00 – PLANTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the furnishing and installation of landscaping.

1.3 REFERENCES

A. Except as herein specified or as indicated on the Drawings, the work of this Section shall comply with the following:
   1. American Joint Committee on Horticultural Nomenclature (AJCHN) - Standardized Plant Names.
   2. American National Standards Institute (ANSI): ANSI Z60.1 - American Standard for Nursery Stock.

1.4 DEFINITIONS

A. Terms:
   1. Nursery Stock:
      a. Trees and shrubs in a recognized nursery in accordance with good horticultural practices.
      b. Healthy, vigorous stock grown under climatic conditions similar to conditions in the locality of the Project and free of disease, insects, eggs, larvae, and defects such as knots, sun-scald, injuries, abrasions, or disfigurement.
   2. Collected Stock:
      a. Such plants as may be secured from their native locations in woodlands or fields, other than nurseries, outside of the limits of the Project.
      b. Well shaped, vigorous, and healthy, free from scale, disease, defects, and disfigurements.
      c. Subject to the approval of Engineer.

1.5 QUALITY ASSURANCE

A. Landscape Subcontractor: The work of this Section shall be performed by a single firm specializing in landscape work, unless otherwise approved by Engineer.

B. Source Quality Control:
   1. Comply with governing regulations applicable to landscape materials.
   2. Supply landscape architect with certificates of inspection as required by governmental agencies.
   3. Landscape architect reserves the right to inspect trees and shrubs either at place of growth or at the Site before planting, for compliance with requirements for name, variety, size, and quality. Failure of landscape architect to inspect trees and shrubs prior to planting does not remove Contractor's responsibility to fully comply with applicable requirements.
   4. Comply with the sizing and grading standards of the latest edition of ANSI Z60.1. A plant shall be dimensioned as it stands in its natural position.
   5. Plants shall be grown under climatic conditions similar to those in the locality of the Site for a minimum of 2 years.
   6. Stock furnished shall be at least the minimum size indicated. Larger stock is acceptable, at no charge. Larger plants shall not be cut back to size indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery:
   1. Deliver packaged materials in containers showing weight, analysis, and name of manufacturer.
   2. Deliver trees and shrubs only after preparations for planting have been completed.

3. Trees and Shrubs:
    a. Do not prune prior to delivery.
    b. Do not use trees or shrubs which have been in cold storage or heeled-in.
    c. Provide freshly dug trees and shrubs.
    d. Immediately before digging, spray material in full leaf with antidesiccant, applying adequate film over trunks, branches, twigs and foliage.
    e. Dig up and prepare for shipment in a manner that will not cause damage to branches, shape and future development after planting.
    f. Ball plants with firm natural balls of earth of diameter and depth no less than that recommended by American Standard for Nursery Stock. Firmly wrap root balls with burlap.
    g. Drum lace plants which are 2 inches in caliper or over.
    h. Plants will be rejected if ball is cracked or broken either before or during process of planting.
    i. Provide protective covering during delivery.
    j. Water heeled in plantings daily.
    k. No plants shall be bound with rope or wire in such a manner that could damage or break the branches.

B. Storage and Handling:
1. Protect plants and materials from damage and deterioration while stored.
2. Protect root balls from sun and drying winds.
3. Set balled and burlapped plant which cannot be planted upon delivery on ground in shade, protected with soil and roots kept moist.
4. Do not remove container-grown stock from containers until planting time.
5. In the event of damage, make necessary replacements as approved by the Engineer and at no additional cost to Owner.
6. Do not drop plants.
7. Do not pick up container or balled plants by stems or trunks.

C. Rejected Material and Replacements:
1. Reject damaged, deteriorated, or contaminated materials and immediately remove from the Site.
2. Replace rejected materials with new materials at no additional cost to Owner.
3. Make replacement during the growing season following the rejection.
4. Match replacement material to adjacent specimens of same species in both size and character, including increase in growth since planting.
5. Only 1 replacement will be required at end of warranty period, except for replacements due to failure to comply with specified requirements.
6. Repair damage to other plants or lawns during replacement at no additional cost to Owner.

1.7 WARRANTY

A. Warranty: Warranty trees and shrubs for a period of 1 year after date of acceptance against defects, including death and unsatisfactory growth, except for defects resulting from neglect by Owner, abuse, or damage by others or unusual phenomena or incidents which are beyond Contractor's control.

B. Replacements:
1. Remove and replace trees, shrubs, or other plants found to be dead or in unhealthy condition during guarantee period.
2. Make replacements during the growing season following the end of the guarantee period.
3. Furnish and plant replacements which comply with this Section.
4. Replace trees and shrubs which are in doubtful condition at end of guarantee period unless, in the opinion of Engineer, it is satisfactory to extend guarantee period for a full growing season.
5. Engineer will make inspection at end of extended guarantee period, if any, to determine acceptance or rejection.
6. Only 1 replacement will be required at end of guarantee period, except for losses or replacements due to failure to comply with specified requirements.
7. Repair damage to other plants or lawns during plant replacements at no additional cost to Owner.

1.8 MAINTENANCE

A. Maintenance Period:
   1. Begin maintenance immediately after planting.
   2. Maintain trees, shrubs, and other plants until final acceptance, but in no case less than 60 days after planting.

B. Procedures:
   1. Maintain trees, shrubs, and other plants by pruning, cultivating, and weeding as required for healthy growth.
   2. Restore planting saucers.
   3. Inspect for adequate watering by Owner. Inform Owner in writing of any corrective measures needed to provide adequate watering.
   4. Tighten and repair stake and guy supports and reset trees and shrubs to proper grades or vertical position as required.
   5. Spray as required to keep trees and shrubs free of insects and disease.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Topsoil: In accordance with Division 31 Section “Grading.”

B. Fertilizer:
   1. Type A: "Drimanure” applied in accordance with manufacturer’s recommendations; Shemins’ telephone number 313.291.1200.
   2. Type B: “Shemins 13-13-13”. Apply in accordance with manufacturer’s recommendations; Shemins’ telephone number 313.291.1200.
   3. Or approved equal.

C. Planting Mixture:
   1. Type A - Trees:
      a. Standard planting backfill shall be a mixture of 2/3 native soil (excavated from plant pits), 1/3 topsoil.
      b. Add peat, fertilizer Types "A" and "B" to planting mixture in accordance with Manufacturer's requirements, follow planting details as indicated on Drawings.
   2. Type B - Perennial Flowers, Groundcover Beds and Ericaceous Plants:
      a. Planting backfill shall be a mixture of 1/3 screened topsoil, 1/3 sand and 1/3 peat.
      b. All existing soil shall be excavated and removed. Adding fertilizer Types "A" and "B" to mixture in accordance with Manufacturer's requirements.
      c. Add fertilizer Types "A" and "B" to mixture in accordance with Manufacturer's requirements. Follow planting details.
   3. Type C - Annual Flower Beds:
      a. Planting backfill shall be a mixture of 1/3 screened topsoil, 1/3 sand and 1/3 peat.
      b. All existing soil shall be excavated and removed. Add fertilizer Types "A" and "B" to mixture in accordance with Manufacturer's requirements. Follow planting details.
      c. Submit a sample to the landscape architect for approval prior to installation.

D. Peat Moss:
   1. Brown to black in color, weed and seed free, granulated, raw horticultural grade peat moss, supplied in bales from commercial source.
   2. Provide ASTM D2607 sphagnum peat moss with a pH below 6.0 for ericaceous plants.
   3. Not less than 90% organic matter by weight on oven dried basis.
   4. Not less than 35% or more than 55% moisture, by weight.
   5. Ash Content: 10% maximum.

E. Mulch:
   1. Shredded Bark:
      a. Double processed, dark, shredded hardwood bark that is clean, and free of debris and sticks.
      b. Materials shall be uniform in size, shape and texture.
      c. Submit samples for approval prior to installation.
      d. Install mulch to finish grade, level smooth, without ridges, humps or depressions.

F. Water:
   1. Free of substances harmful to plant growth.
   2. Hoses or other methods of transportation furnished by Subcontractor.

G. Trees and Shrubs:
   1. Supply trees and shrubs for nursery stock or collected stock.
   2. Provide plant materials true to name and variety established by the AJCHN - Standardized Plant Names.
   3. Provide trees, shrubs, and other plants complying with the recommendations and requirements of ANSI Z60.1 and as further specified.
   4. Provide deciduous trees of height and caliper listed or indicated and with branching configuration recommended by ANSI Z60.1 for type and species required. Provide single-stem trees except where special forms are shown or listed.
   5. Provide deciduous shrubs of the height indicated on the Drawings and with not less than the minimum number of canes required by ANSI Z60.1 for the type and height of shrub required.
   6. Provide bare-root plants as indicated on the Drawings: Dug with adequate fibrous roots to be covered with a uniformly thick coating of mud immediately after they are dug or packed in moist straw or peat moss.
   7. Container Grown Stock: Grown in a container for sufficient length of time for the root system to have developed to hold its soil together, firm and whole.
      a. No plants shall be loose in container.
      b. Container stock shall not be root bound.
      c. The measurements for height shall be taken from the ground level to the average height of the top of the plant and not the longest branch.
      d. Single stemmed or thin plants will not be accepted.
      e. Side branches shall be generous, well twigged and the plant as a whole well bushed to the ground.
      f. Plants shall be in a moist, vigorous condition, free from dead wood, bruises or other root branch injuries.
   8. Evergreens:
      a. Provide evergreens of size indicated on the Drawings.
      b. Dimensions indicate minimum spread for spreading and semi-spreading type evergreens and height for other types such as globe, dwarf, cone, pyramidal, broad upright, and columnar.
      c. Provide normal quality evergreens with well balanced form complying with requirements for other size relationships to the primary dimension shown.
   9. Balled and Burlapped Stock:
      a. Provide plants typical of their species or variety; with normal, densely developed branches and vigorous, fibrous root systems. Provide only sound, healthy, vigorous plants free from defects, disfiguring knots, sunscald injuries, frost cracks, abrasions of the bark, plant diseases, insect eggs, borers, and any forms of infestation. The plants shall have a fully developed form without voids and open spaces. Dig balled and burlapped plants with firm, natural balls of earth of sufficient diameter and depth to encompass the fibrous and feeding root system necessary for full recovery of the plant. Provide ball sizes complying with the latest edition of the "American Standard for Nursery Stock" or larger as required on Drawings. Cracked or mushroomed balls are not acceptable.
      b. Provide tree species that mature at heights over 25 feet with a single, main trunk. Trees that have the main trunk forming a "Y" shape are not acceptable.
   10. Provide plants with a normal habit of growth and shall be sound, healthy, vigorous plants with well developed root systems.
   11. Plants shall be free of disease, insects, eggs and larvae.
   12. Trees with bark abrasions, sunscalds, disfiguring knots, or fresh cuts of limbs over 1-1/4 inches which have not completely callused will be rejected.
   13. Measure plants when branches are in normal position. Height and spread dimensions specified refer to main body of plant and not from tip to branch tip.
   14. Take caliper measurements at point on trunk 6 inches above natural ground line for trees up to, and including 4 inches in caliper and 12 inches above natural ground line for trees over 4 inches in caliper.

15. If range of sizes is given, no plant shall be less than minimum size and not less than 50% of plants shall be as large as upper half of range specified.
16. Measurements specified are measurements after pruning where pruning is required.
17. Plants that meet measurements specified, but do not possess normal balance between height and spread, will be rejected.
18. Substitutions of plant materials will not be permitted unless authorized in writing by Engineer.

H. Maintenance Strips:
1. Stone: 1 inch to 1-1/2 inches washed stone.
2. Weed Barrier: Micrascape by Mirafi, Inc., Charlotte, NC; or equal by Reemay, Old Hickory, TN.

I. Staking Materials:
1. Stakes:
   a. Sound new hardwood or treated softwood free of knot holes and other defects which would impair strength.
   b. 2-inch x 2-inch x 8-foot long square.
2. Guying/Staking: 3/4-inch Arbortie nylon strap (NO WIRE AND HOSE PERMITTED).

J. Antidesiccant: Wilt Pruf by Nursery Specialty Products, Inc.; or approved equal.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine proposed planting areas and conditions of installation. Do not start planting work until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Location:
1. Notify landscape architect at least 7 working days prior to installation of plant material.
2. Protect existing utilities, paving and other facilities from damage caused by landscaping operations.
3. Stake location of trees and plants and outlines for planting beds on ground prior to digging.
4. Notify Engineer 24 hours in advance when staking is complete for onsite review.
5. If staking approval is not requested and plants are installed without approval, Engineer reserves the right to have trees and plant material moved at no additional cost to Owner.
6. If underground obstructions are encountered during excavation of tree pits, alternate locations may be selected by Engineer or a change to the Contract may be provided.

B. Time of Planting:
1. Evergreen Material: Plant evergreen materials between September 1 and October 15 or in spring before new growth begins. If project requirements require planting at other times, spray plants with anti-desiccant prior to planting operations.
2. Deciduous Material: Plant deciduous materials in a dormant condition. If deciduous trees are planted in leaf, spray with anti-desiccant prior to planting operation.
3. Planting times other than those indicated must be acceptable to the landscape architect.
4. Planting shall be performed only by experienced workmen familiar with planting procedures under the supervision of a qualified supervisor.
5. Planting pits shall be round, with vertical sides and flat bottoms, and sized in accordance with outlines and dimensions of the planting details indicated on the Drawings.
6. Individual plant locations shall be staked on the Site by the Subcontractor and approved by the landscape architect before any planting pits are dug. The landscape architect reserves the right to adjust plant material locations to meet field conditions, without additional cost to the Contractor or Owner.
7. If obstructions are encountered that are not indicated, do not proceed with planting operations until alternative plant locations have been selected and approved in writing by the landscape architect. Where location or spacing dimensions are not clearly indicated, request clarification by the landscape architect.
8. See Drawings for planting details.

C. Preparation of Planting Soil:
   1. Before mixing, clean topsoil of roots, plants, sods, clay lumps, and other extraneous materials harmful or toxic to plant growth.
   2. Plant soil shall consist of a uniform mixture of topsoil, peat moss and fertilizer.
   3. One cubic yard of plant soil shall contain 3/4 cubic yard of topsoil, 1/4 cubic yard of peat moss and sufficient chemical fertilizer if planting will not follow placing of planting soil within a few days.
   4. Delay mixing of fertilizer if planting will not follow placing of planting soil within a few days.
   5. For pit and trench type backfill, mix planting soil prior to backfilling and stockpile at the Site.
   6. For planting beds, mix planting soil prior to planting or apply on surface of topsoil and mix thoroughly before planting.

D. Pruning and Shaping:
   1. Prune only for the preservation for each plant's natural character.
   2. Prune after delivery but prior to planting.
   3. Prune, thin out, and shape trees and shrubs in accordance with standard horticultural practice.
   4. Limit pruning to 32% of total plant structure as necessary to remove dead or injured twigs and branches and to compensate for root loss resulting from transplanting.
   5. Do not cut leaders.
   6. Seal cuts over 1/2-inch in size with standard pruning paint.
   7. Evergreens shall be pruned only to the extent of removing broken or damaged branches.
   8. Remove and replace excessively pruned or misformed stock resulting from improper pruning.

3.3 VEGETATION REMOVAL

A. Provide landscape preparation as indicated on the Drawings:
   1. Strip existing grass and weeds, including roots from bed areas leaving the soil surface 1-inch below finish grade.
   2. Herbicide: Use "Round Up" (Monsanto Company) as required to prepare area for new planting, applied to groundcover, evergreen and shrubbery beds and the mulch areas before application of pre-emergence herbicide, in accordance with Manufacturer's recommendations. Clean area of dead material after 5 days.
   3. Pre-Emergence Herbicide: DACHTHAL W-75 (Diamond Shamrock Agricultural Chemicals) applied to 1 ounce per 100 square feet to same area where "Herbicide" has been applied and after area is cleared of dead vegetation and to planting bed areas.
   4. Herbicides to be applied by licensed applicator as required by the State.
   5. Excavate circular plant pits with vertical sides, except for plants specifically indicated to be planted in beds. Provide plant pits in accordance with planting details indicated on the Drawings. Depth of pit shall accommodate the root system. Scarify the bottom of the pit to a depth of 6 inches.
   6. Provide premixed planting mixture Type "A" for use around the balls and roots of the deciduous and evergreen tree plantings.

B. Ground Cover Beds, Perennial Flower Beds and Ericaceous Plant Beds: Excavate existing soil to 12-inch depth over entire bed area and remove soil from Site. Scarify bottom of bed to a 4-inch depth. Set plants as indicated on the Drawings and backfill entire bed with premixed planting mixture Type "B".

C. Mass Shrub Beds/Hedge Beds: Excavate existing soil to 18-inch depth over entire bed area and remove soil from Site. Scarify bottom of the bed to a 4-inch depth. Set plants according to Drawings and Specifications. Backfill entire bed with (premixed) specified planting mixture Type "A".

D. Annual Flower Beds: Excavate existing soil to 8-inch depth over entire bed area and remove soil from Site. Scarify bottom of bed to 4-inch depth. Backfill entire bed to an 8-inch depth with premixed planting mixture Type “B”.

3.4 INSTALLATION

A. General:
   1. Set material in the planting pit to proper grade and alignment.
   2. Set plants upright, plumb and faced to give the best appearance or relationship to each other or adjacent structure. Set plant material 2 inches to 3 inches above the finish grade.

3. Remove top of ball and excess soil to expose the root flare at base of trunk. Raise or lower tree for root flare to be a correct level to grade outside of planting pit.
4. No filling will be permitted around trunks or stems. Backfill the pit with planting mixture and soil removed from top of ball. Do not use frozen or muddy mixtures for backfilling.
5. Form a ring of soil around the edge of each planting pit to retain water.
6. After balled and burlapped plants are set, tamp planting soil mixture around bases of balls and fill voids.
7. Remove burlap, ropes and wires from the top half of root ball.
8. Space ground cover plants in accordance with indicated dimensions on the Drawings. Adjust spacing as necessary to evenly fill planting bed with indicated quantity of plants. Plant to within 12 inches of trunks of trees and shrubs within planting bed and to within 6 inches of edge of bed.
9. Spread and arrange roots of bare rooted plants in their natural position. Work in planting mixture. Do not mat roots together. Cut broken and frayed roots before installing planting mixture.
10. Water immediately after planting.
11. Apply pre-emergent herbicide to bed areas in accordance with Manufacturer's recommendations before mulching.

B. Antidesiccants:
   1. If deciduous trees or shrubs are moved in full leaf, spray with antidesiccant 2 weeks after planting.
   2. Apply antidesiccant using power spray to provide adequate film over trunks, branches, stems, twigs and foliage.

C. Balled and Burlapped Stock:
   1. Plants planted in rows shall be matched in form. Plants larger than those specified in the plant list may be used when acceptable to the landscape architect If the use of larger plants is acceptable, increase the spread of roots or root ball in proportion to the size of the plant. The height of the trees, specified by height measured from the crown of the roots to the top of the top branch, shall not be less than the minimum size designated on the Drawings. No pruning wounds shall be present with a diameter of more than 1-inch and such wounds must show vigorous bark on the edges. Evergreen trees shall be unsheared and branched to the ground. Shrubs and small plants shall meet the requirements for spread and height indicated on the Drawings.

D. Staking and Guying:
   1. Staking:
      a. Stake/guy the trees immediately after installation. When high winds or other conditions which may affect tree survival or appearance occur during the warranty period, the Subcontractor shall immediately repair the staking/guying.
      b. Accurately stake plant material according to the Drawings. Stakes shall be above grade and painted a bright color to be clearly visible for inspection.
      c. Stake deciduous trees under 4-inch caliper with 2 x 2 cedar stakes, 2 per tree.
      d. Stake evergreen trees under 6-foot tall with 2 x 2 cedar stakes, 2 per tree.
      e. Stake evergreen trees 6-foot tall and over with metal fence post, 3 per tree. Drive stakes to avoid the ball and not closer than 1-foot from the trunk.
      f. Extend stakes a minimum of 18 inches below bottom of tree ball or root base of item being staked.
      g. Extend stakes upwards parallel to the trunk.
      h. Trim stakes after installation so that height above grade is no more than 6 feet or 2/3 the plant height.
      i. Work shall be acceptable to the landscape architect and Owner’s representative.
   2. Guying:
      a. Inspect trees for injury to trunks, evidence of insect infestation and improper pruning before wrapping.
      b. Wrap trunks of trees spirally from bottom to top with specified tree wrap and secure in place. Guy with Arbortie nylon straps in accordance with planting details on the Drawings.
      c. Stake/guy the trees immediately after installation. When high winds or other conditions which may affect tree survival or appearance occur during the warranty period, the Subcontractor shall immediately repair the staking/guying.
      d. Guy deciduous trees 4-inch caliper and over. Stake evergreen trees 6-foot tall and over with metal fence post, 3 per tree.
      e. Firmly attach top of each stake to tree trunk with Arbortie nylon strap (NO WIRE AND HOSE PERMITTED) forming a figure 8 around stake and trunk.
      f. Arbortie nylon strap shall be firmly attached to stake.

g. If, during the life of the Contract, trees blow down or are otherwise damaged because of improper bracing or guying, the trees shall be replaced at no additional cost to Owner.

E. Mulching:
1. Mulch trees and shrub planting pits and shrub beds with double shredded bark mulch 3 inches deep immediately after planting.
2. Water thoroughly, immediately after mulching.
3. After watering, rake mulch to provide a uniform finished surface.
4. Mulch ground cover beds with shredded bark mulch 1-inch to 2-inches deep prior to planting. Plant ground cover through mulch.

F. Pruning:
1. Prune branches of deciduous stock, after planting, to balance the loss of roots and preserve the natural character appropriate to the particular plant requirements. In general, remove 1/4 to 1/3 of the leaf bearing buds, in proportions acceptable to the landscape architect.
2. Remove or cut back broken, damaged and unsymmetrical growth of new wood.
3. Multiple Leader Plants: Preserve the leader which will best promote the symmetry of the plant. Cut branches flush with the trunk of the main branch at a point beyond a lateral shoot or bud, a distance of not less than half the diameter of the supporting branch. Make cut on an angle.
4. Prune evergreens only to remove broken or damaged branches.

3.5 CLEANING

A. Clean the work area daily during plant installation and upon completion of the installation.

B. Remove excess materials, soil, debris, and equipment from the Site. Repair damage resulting from planting operations.

C. Work completed shall be acceptable to the landscape architect and Owner’s representative.

END OF SECTION 32 90 00

SECTION 32 92 00 – TURF AND GRASSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the furnishing and installation of the major items listed below:
   1. Seed.
   2. Fertilizer.
   3. Mulch.
   4. Sod.
   5. Dune grass.

1.3 REFERENCES

A. Except as herein specified or as indicated on the Drawings, the work of this Section shall comply with the following:
   1. State DOT Current Standards:
      a. Specifications for Construction.
      b. Standard Plans.

1.4 DEFINITIONS

A. Follow-up Maintenance: Maintenance required when seeding, sodding, or other vegetative practices do not achieve the desired degree of stabilization.

B. Periodic Maintenance: Maintenance performed after the vegetation has been established.

1.5 LOCATION

A. Sodded Areas: As indicated on the Drawings.

B. Seeded Areas: All disturbed areas within the project limits not covered by other surface improvements or features.

C. Mulch Blankets: As indicated on the Drawings.

1.6 SUBMITTALS

A. Action Submittals: Product Data for mulch blanket.

B. Informational Submittals:
   1. Samples: For netting and mulch blanket.
   2. Supplier's certified analysis for each seed and fertilizer mixture required.

1.7 QUALITY ASSURANCE

A. Fabrication and Installation Personnel Qualifications:
   1. Trained and experienced in the fabrication and installation of the materials and equipment.
   2. Knowledgeable of the design and the reviewed Submittals.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original, unbroken, brand marked containers or wrapping as applicable.

B. Handle and store materials in a manner which will prevent deterioration, damage, contamination with foreign matter, and damage by weather or elements, and according to Manufacturer's directions.

C. Reject damaged, deteriorated or contaminated material and immediately remove from the Site. Replace rejected materials with new materials at no additional cost to Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Topsoil: In accordance with Division 31 Section “Grading.”

B. Fertilizer:
   1. Comply with MDOT 917.10, Class b except as herein specified.
   2. Liquid Fertilizer for Hydroseed: 16-32-4 containing no chlorine.

C. Seed:
   1. Mixture composed of certified seed of the following purity, germination, and proportions by Weight:
      a. Lawns: MDOT THM
      b. Other Areas: MDOT THM
   2. Furnish seed in durable bags, each marked by the supplier of the blended mix with a tag giving name, lot number, net weight of contents, purity, and germination.

D. Mulch:
   1. Small Grain:
      a. Straw.
      b. Hay.
   2. Anchoring Material for Small Grain Mulch:
      a. Netting:
         1) Biodegradable.
         2) Openings not to exceed 1-1/2 inches x 2 inches.
         3) Minimum Roll Width: 35 inches.
         4) Anchoring Staples or Pins: Wood pegs at least 6 inches long.
   3. Hydromulch:
      a. Slurry: Minimum 60% wood fiber mulch with remaining being recycled cellulose fibers.
      b. Tackifier:
         1) Manufacturers: Finn Fiber Plus; Finn Fiber Gum; or equal.
         2) Synthetic fiber or gum.
   4. Mulch Blankets:
      a. Biodegradable:
         1) Straw: North American Green S-75; or equal.
         2) Coconut: North American Green C-125; or equal.
         3) Straw and Coconut: North American Green SC-150; or equal.
      b. Non Degradable Polyester: North American Green P-300; or equal.
      c. Anchoring Staples or Pins:
         1) Hardwood stakes at least 6 inches long.

E. Sod: Comply with MDOT Section 917.13,except as herein specified.

PART 3 - EXECUTION

3.1 TOPSOIL

A. In accordance with Division 31 Section “Grading.”

3.2 SEEDBED PREPARATION

A. General:
   1. After the areas to be seeded have been brought to the required grade and properly trimmed, bring soil to a friable condition by disking, harrowing, or otherwise loosening and mixing to a depth of 3 inches to 4 inches. Thoroughly break all lumps and clods.
   2. If the prepared seedbed is not fertilized, satisfactorily seeded, and mulched before the friable condition is lost through compaction or crusting, repeat the seedbed preparation prior to seeding or reseeding.

B. Raking: Rake prepared seedbed before seeding.

3.3 FERTILIZING

A. Dry Fertilizer:
   1. Broadcast on surface as first step in seeding process.
   2. Apply with seeding if drilled.
   3. Work fertilizer into the soil to a depth of 1-inch to 2 inches.
   4. Apply uniformly.
   5. Application Rate: Equivalent to 240 pounds per acre of 12-12-12.

B. Hydroseeding:
   1. Apply fertilizer with seed.
   2. Application Rate: Equivalent to 6.25 pounds per 1,000 square feet 272 pounds per acre of 16-32-4.

3.4 SEEDING

A. Scheduling:
   1. Within 30 days from the time the area was first disturbed.
   2. Seasonal Limitations:
      a. April 20 through November 1.
      b. Dormant seeding after November 1.

B. Sowing:
   1. Sow the seed following or in conjunction with the fertilizer and while the seed bed is in a friable condition.
   2. Do not sow seeds through mulch.
   3. Application Rate:
      a. Lawn Areas: Sow seed at a minimum rate of 5 pounds per 1,000 square feet.
      b. Other Areas: Sow seed at a minimum rate of 5 pounds per 1,000 square feet.

C. Finishing: Float and lightly compact areas sown by hydro-seeder or the broadcast method to incorporate the seed into the uppermost 1/2-inch of the soil.

D. Method:
   1. Broadcast: Do not seed when wind velocity exceeds 5 miles per hour.
   2. Mechanical drills.
   3. Hydroseeder:
      a. Use only equipment specifically designed for hydraulic seeding application.
      b. Mix seed, fertilizer and pulverized mulch in water until uniformly blended into homogeneous slurry.
      c. Continue mixing during application.

E. Inspection: Areas which are sown by hydro-seeder or the broadcast method shall be visually inspected for uniformity of application; areas in which visual inspection fails to reveal an average of 2 seeds per square inch shall be resown at no additional cost to Owner.

F. Seed on Slopes: Protect seeded slopes against erosion with netting, asphalt emulsion adhesive or other methods acceptable to Engineer.

3.5 MULCHING

A. Small Grain Mulch:
   1. Application:
      a. Immediately after seeding.
      b. Uniform distribution.
      c. Allow sunlight to penetrate mulch.
   2. Application Rate: Two tons per acre (2-1/2 bales per 1000 square feet).
   3. Anchoring:
      a. Mulch anchoring tool.
      b. Netting.
      c. Asphalt Emulsion Adhesive:
         1) Hold mulch in place with asphalt emulsion or other materials approved by Engineer.
         2) Apply emulsion uniformly at a rate of 200 gallons per acre.
         3) Spray emulsion simultaneously with the mulch or immediately following mulching.
         4) Protect signs, structures, and other objects from being marked or disfigured by adhesive materials.
         5) Do not apply during freezing weather.

B. Hydromulch:
   1. Apply with hydroseed or following seeding by other method.
   2. Application Rate: 1,250 pounds per acre.
   3. Do not apply if rain is anticipated within 24 hours. Reapplication is required after rain damage at Contractor’s expense.

C. Mulch Blankets:
   1. Netting on top.
   2. Fibers in direct contact with soil.
   3. Staple in accordance with Manufacturer's guidelines for slope conditions.
   4. Direction of Installation:
      a. Direction of flow of water in intermittent and ephemeral drains.
      b. Perpendicular to sideslopes above normal water level in perennial drains.

3.6 SOD BED PREPARATION

A. Make Area to be Sodded:
   1. Smooth and uniform.
   2. Parallel to the finished grade and cross sections indicated on the Drawings.

3.7 LAYING SOD

A. General:
   1. Moisten sod and place on a moist earth bed.
   2. Lay sod within 24 hours after cutting and properly protect it until placed.
   3. Carefully place the sod by hand in rows at right angles to the slopes, commencing at the base of the area to be sodded and working upward.
   4. Do not use pitch forks to handle sod. Dumping from vehicles will not be permitted.
   5. Extend bottom edge of sodded areas at least 2 inches into the ground or ditch bottom.
   6. Break transverse joints of sod strips and carefully lay sod to produce tight joints.
   7. When the sod may be displaced during sodding operations, work from ladders or treaded planks.
   8. Firmly compact the sod by tamping immediately after it is placed.
   9. After tamping, the sod shall present a smooth, even surface free from bumps and depressions.

B. Sod on Slopes:
   1. On slopes steeper than 1 vertical to 3 horizontal, peg the sod with wooden pegs.
   2. Space pegs not over 2 feet apart in any direction.
   3. Drive pegs flush with the surface of the sod.

C. Frozen Materials:
   1. Do not place frozen sod.
   2. Do not place sod on frozen soil.

D. Watering: After placing sod, water with an initial application of 15 gallons per 100 square feet.

3.8 MAINTENANCE

A. General:
   1. Contractor: Responsible for follow-up maintenance.
   2. Contractor is responsible for periodic maintenance for 60 days after completion of areas of seeding or sodding.

B. Follow-up Maintenance:
   1. Inspect materials planted in the spring during the summer or early fall, and take corrective action during the fall planting season.
   2. Inspect materials planted in the fall during the spring and take corrective action during this spring planting season.
   3. Reseed, sod, plant, fertilize, mulch, topsoil, grade and roll as necessary to achieve a uniform lawn free from eroded or bare areas.
   4. Water seeded areas as required to maintain the viability of the Product.

C. Periodic Maintenance:
   1. Mow grass at 3-inch to 3-1/2-inch height and subsequent mowing as required to maintain 1-1/2-inch to 2-inch height.
   2. Spot seed areas damaged by traffic or other means.

END OF SECTION 32 92 00

SECTION 33 05 30 – UTILITY HORIZONTAL DIRECTIONAL DRILLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the design, furnishing and installation of a pipe crossing under a street or highway, without disturbing the surface, except at entry and exit points.

1.3 REFERENCES

A. Except as herein specified or as indicated on the Drawings, the work of this Section shall comply with the following:
   1. ASTM Standard Specifications:
      a. D2321 – Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and other Gravity-Flow Applications.
      b. D2774 - Underground Installation of Thermoplastic Pressure Pipe.
      c. D3261 - Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
      d. D3350 - Polyethylene Plastics Pipe and Fittings Materials.
      e. F1962 - Guide for Use of Maxi-Horizontal Directional Drilling for Placement of Polyethylene Pipe or Conduit Under Obstacles, Including River Crossings.
   2. AWWA Standards and Manuals:
      a. C906 - Standard for Polyethylene (PE) Pressure Pipe and Fittings, 4 In. (100 mm) Through 63 In. (1,575 mm), for Water Distribution and Transmission
      b. M55 – PE Pipe – Design and Installation.
   3. State DOT Current Standards:
      a. Specifications for Construction.
      b. Standard Plans.
      c. Special Provisions for Horizontal Directional Drilling.

1.4 DESIGN AND PERFORMANCE REQUIREMENTS

A. Minimum Requirements:
   1. The requirements herein and indicated on the Drawings are minimum requirements.
   2. Product pipe shall be minimum internal diameter of 7.25-inches and designed to withstand a minimum internal working pressure of 125 psi at elevation 785 with an additional minimum surge allowance of 50% of the working pressure. External pressures and loads shall not be used to offset internal design pressures.
   3. Select equipment necessary to provide the indicated finished product in the conditions present at the Site.
   4. If, in the opinion of the Contractor, additional geotechnical investigation is required for the design to define the soil conditions, the Contractor shall obtain additional geotechnical information at no cost to the Owner.
   5. No claim for unforeseen condition will be permitted.
   6. Design shall be performed by an engineer licensed in the state that the work occurs.
   7. Review of submittals by Engineer does not relieve Contractor from responsibilities under this specification.

1.5 SUBMITTALS

A. Delegated Design Action Submittals:
   1. Calculations and drawings to support and identify the pipe class, installation, thrust and tensile forces, and proposed pipe.
   2. Calculations and methods for buoyancy modifications during pull back.

3. Transition fittings at changes in pipe material.
4. Horizontal and vertical alignment drawing of the pilot hole at the same scale as the Drawings.
5. Equipment and materials staging plan, including traffic control.
6. Method for directional drill.
7. Pullback and torque capacity of drill rig(s).
8. Equipment and method for monitoring the location of the drill head.
9. Project workplan and schedule.

B. Informational Submittals:
1. Evidence of current licensure of design engineer in the state in which the work will occur,
2. Provide a log of the following information:
   a. Drill head location.
   b. Axial and torsional loads.
   c. Drilling fluid discharge rate and pressure.
3. Pipe Manufacturer material certifications.
4. Information on drilling fluids to be used.
5. For HDPE pipe, submit pipe Manufacturer's sworn and notarized statements that Contractor has been trained and certified in the handling and joining of the pipe Manufacturer’s materials.

C. Close-Out Submittals:
1. After completion of the directional drilling operation, provide an as-built drawing.
2. Drawing to Include:
   a. Scale: Same as Drawings.
   b. Tabulation of pipeline depth at 25-foot intervals referenced to a stationed alignment located above the pipe.
   c. Tabulation of horizontal alignment points at 25-foot intervals with points being either witnessed to two permanent landmarks or based upon a surveyed and documented coordinate system.

1.6 QUALITY ASSURANCE

A. Installation Personnel Qualifications:
1. Trained and experienced in the use of directional drilling equipment and installation of the materials, for the specific application of Project.
2. Knowledgeable of the design and in down hole drilling, impact of drilling in various geological formations, sensing and recording instrumentation and interpreting computer printout data.
3. Experienced in a minimum of 5 installations of similar or greater complexity and under similar conditions in the last 5 years.
4. The designated Project superintendent shall be present at the Site during work at the Site. Contractor shall not change Project superintendent without written notice to Owner a minimum of 5 working days in advance of the change. Written notice of change shall include detailed information and rationale for staffing change.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Product Pipe:
1. Allowable Pipe Materials: HDPE.
2. HDPE Pipe:
   a. Ductile Iron Pipe Size (DIPS), DR 11 (200 psi)
   b. Material Minimums:
      1) High density polyethylene pipe compound molecular weight of 0.941.
      2) Material Designation: PE 4710.
      3) Material Classification: Type III, Class C, Category 5, Grade P34; ASTM D1248.
      4) Cell Classification: ASTM D3350 445574C/E, PE 4710.
      5) Manufacturing Standard: ASTM D3350.
      6) Pipe shall contain no recycled compounds except that generated in the Manufacturer’s own plant from resin of the same specification from the same raw material.
      7) Blue Stripe
   c. Manufacturers: Poly Pipe, Inc., Performance Pipe, ISCO Industries; or equal.

d. Butt fused joints using equipment and methods in strict accordance with the pipe Manufacturer's recommendations and ASTM D3261 and ASTM D2657.
e. HDPE Fittings:
1) ASTM D3261.
2) Molded or fabricated from polyethylene compound having a cell classification equal to or exceeding the cell classification of the pipe.
3) Molded Fittings: Pressure rated to match the pipe SDR pressure rating to which they are connected.
4) Fabricated Fittings:
a) Made from pipe with a pressure rating at least 25% greater than the pipe to which they are connected.
b) Angle of bends to have tolerance of ± 1% of required angle.
f. Pipe Joining:
1) Pipe to Fitting Joining: Butt fused using equipment and methods in strict accordance with the pipe Manufacturer's recommendations.
2) Joining Segments of Fabricated Fittings: Butt fused using equipment and methods in strict accordance with the pipe Manufacturer's recommendations.
g. Transitions from HDPE Pipe to Other Materials:
1) AWWA C906.
2) Mechanical joint adapter.
3) Obtain Engineer's review.
4) Manufacturers: Phillips Driscopipe, Inc.; Chevron Chemical Company; Plexco; or equal.

3. Product Pipeline Design: Based on Site conditions, performance criteria, and Contractor's means and methods.
4. Entire pipe line shall meet the same design requirements. Pipe segments with different design criteria will not be allowed without written approval of the Engineer and Owner.

B. Drilling Fluids:
1. Organically inert.
2. Fluid composition shall comply with applicable environmental regulations.
3. Select drilling fluid appropriate for conditions encountered at the Site.

C. Casings:
1. At no additional cost to Owner, install casings as needed for the completion of the work or for protection of existing facilities, utilities, properties, and structures.

D. Detection Wire:
1. Copper wire, solid or braided, with coating to prevent oxidation and deterioration.
2. Minimum Gage: 12 AWG.
3. Secure 2 separate wires to outside of product pipeline.

E. Staging Area Fencing:
1. Orange, plastic safety fence supported by steel fence posts.
2. Minimum Height: 4 feet.
3. Maximum Fence Post Spacing: 8 feet.
4. No vertical sags greater than 6 inches between posts.

F. Water: Contractor shall be responsible for supplying water required for the work.
1. Water required for the performance of the work may be obtained through the municipal water supply system. Contractor shall coordinate and pay for temporary connections and usage fees.

PART 3 - EXECUTION:

3.1 LINE AND GRADE

A. Pilot Hole Alignment:
1. Submit pilot hole alignment data for review prior to reaming and pipe installation.
a. Alignment data is required to ensure compliance with alignment tolerance performance criteria.
b. Alignment data submittal review does not relieve the Contractor of responsibility for determining adequate cover for drill fluid containment or other design considerations.

2. Follow the grade as submitted by Contractor and reviewed by Engineer.
    a. Minimum Cover: 5.5 feet at ends and 10 feet elsewhere along pipeline unless otherwise indicated on the Drawings.
    b. Alignment shall be uniform and not include high points greater than 25% of the pipe's inside diameter.
3. Lines and grades shall be established in the field by Contractor and reviewed by Engineer.
4. Provide Engineer with a tabulation and plot of the pilot hole coordinate data at 25-foot intervals referenced to a datum line located above the entrance and exit elevations of the drill.

B. Final Product Pipeline:
1. Unless otherwise constrained by right-of-way or easement limitations, allowable alignment deviation shall be as follows:
    a. At Locations More Than 50 Feet From Each End:
        1) Horizontal: 5 feet.
        2) Vertical: 5 feet.
    b. At Locations Within 50 Feet From Each End:
        1) Horizontal: 2 feet.
        2) Vertical: 0.5 feet

3.2 STAGING AREAS

A. Drill Staging Area:
1. Disturb as little area as possible while providing adequate area for workers and equipment.
2. Keep area neat and orderly.
3. Install and maintain staging area fencing around perimeter.

B. Pipe Staging Area:
1. Disturb as little area as possible while providing adequate area for workers and equipment and to string, assemble, and inspect pipe.
2. Keep area neat and orderly.
3. Install and maintain staging area fencing around perimeter.
4. Provide protection of exposed ends of pipe to prevent entry by children and animals.

C. Establish and maintain within right-of-way and easement boundaries identified by Owner.

D. Restore to original grade and condition after completion of work.

3.3 INSTALLATION

A. General:
1. Install pilot hole and pipe in conformance with the reviewed submittals.
2. Minimize subsurface disruption during drilling and pullback operations, including the setting of casings if necessary due to Site conditions or Contractor's operations.
3. During pilot hole installation, notify Engineer immediately if partial or full blockage is encountered.
4. Complete operation as expeditiously as possible.
5. Disposal:
    a. Locate an acceptable site for disposal of drilling fluids and excess soils resulting from drilling operation.
    b. Be responsible for transport of materials to and from the Site to the disposal area as well as disposal costs.
    c. Disposal shall comply with applicable environmental and right-of-way regulations.
6. Install and maintain measures to protect existing utilities and physical features from damage during the Project, including but not limited to damage caused by equipment, settlement, or vibration.

B. Vibration and Noise:
1. Limit vibration to a maximum of 0.2 inches/second on each nearby structure. Provide continual vibration monitoring, maximum of 1 minute data point intervals, on or adjacent to structures affected during activities which may exceed this limit. Provide Engineer with copy of data log.
2. Limit sound levels to a maximum of 67 dB(A) during non-working hours as measured at nearby occupied structures. Sound levels during working hours shall conform to local regulations, or industry standards if no local regulations exist.

C. Heaving and Settlement:
   1. Actively monitor for signs of heaving and settlement during drilling operations.
   2. Include settling control points on the surfaces or structures as specified below and survey their elevation on a daily basis:
      a. Structures adjacent to the work that may be impacted depending on distance from the drilling operation.
      b. Control points at the intersection of M-43 (W. Saginaw Highway) and Degroff Street including the centerline of M-100 and each edge of the roadway.
      c. Control points at the intersection of M-100 (E. Jefferson Street) and Franklin Street including the centerline of M-100 and each edge of the roadway.
      d. Other points as determined in the field by Engineer.
      e. Other points as required by Contractor.
   3. Readings shall be taken with an optical or laser level with an accuracy of ±0.01-foot.

D. Drilling Fluids:
   1. Source:
      a. Supply materials required for drilling fluids , including but not limited to water .
   2. Inadvertent Returns:
      a. Minimize drilling fluid returns at locations other than drilling entry and exit points.
      b. Immediately clean up inadvertent returns.
      c. Be responsible for paying for costs and obtaining permits required for cleanup efforts.
      d. Be responsible to repair damage caused by inadvertent returns.
      e. Be responsible to repair, clean up, or replace , including temporary water supply required water supply wells affected by inadvertent returns.
   3. Containment:
      a. Ensure that equipment is in working order to prevent leakage.
      b. Provide protective measures on the Site to prevent migration of drilling fluids out of the staging areas.
      c. Immediately remove and clean-up drilling fluids outside of the containment areas.
      d. Protect adjacent waterways and storm water facilities from drill fluid contamination.

E. Drill Head Locating:
   1. Establish method for determining the location of the advancing drill head.
   2. Calculate and plot true vertical depth, horizontal distance and right and left bearing drift.
   3. Verify drill head location at least every 25 feet.

F. Pre reaming:
   1. Determine if pre reaming is required.
   2. If prereaming is performed:
      a. Determine required diameter to minimize subsurface disruption and allow unhindered pullback of the product pipeline.
      b. Ensure that annular space around product pipeline is stabilized to prevent settlement.
   3. During the operation, monitor the movement of the reaming head to ensure the hole is free of obstructions along the walls which could reduce the cross section of the installed pipe or which may hinder the pullback of the product pipeline.

G. Placement of Pipe:
   1. Pull Back:
      a. Use appropriate connection equipment between product pipeline and pullback pipe to eliminate transfer of rotational forces to product pipeline.
      b. Support pipe as required to ensure a smooth, freely moving pull back.
      c. Control and limit tensile load on the pipe by devices such as hydraulic pressure regulators or load sensors.
      d. The maximum tensile load on the pipe shall not exceed the maximum allowable load recommended by the pipe Manufacturer.
   2. Detection Wire:
      a. Secure the detection wire to the outside of the pipe to prevent the wire from being dislodged, broken, or stretched during pullback.
      b. Pull detection wire along with the pipe.

3.4 CLEANING

A. Prior to testing, clean pipe using appropriately sized cleaning swabs. Provide containment, filtering, and disposal required for discharge water. Repeat cleaning swab passes as necessary to remove residual soil and drilling fluid contaminants from the pipeline. Multiple swabs may be run in series at the Contractor's option.

3.5 TESTING

A. Pre-Installation Testing:
   1. Conduct low pressure air test prior to pull-back operation.
   2. Restrain piping and components against uncontrolled movement.
   3. Pressurize to a minimum of 4.0 psi and maintained for a minimum of 2 hours.
   4. Check joints by swabbing with a mild soap solution.
   5. Leaking joints shall be removed and pipeline re-joined in accordance with Manufacturer's recommendations.

B. Post Installation Deflection Testing:
   1. Gage Outside Diameter: Not less than 95% of maximum inside pipe diameter with allowance for weld bead thickness.
   2. Allowable Maximum Deflection: 5% of diameter.
   3. Pull Go-No-Go Gage Through Each Section:
      a. Pulled by one person with no mechanical advantage.
      b. Pulled with mechanical advantage:
         1) Utilize pullback force monitoring and recording device capable of continuous recording and minimum force accuracy of 0.5 pounds.
   4. Go-No Go Gage indicates greater than 5% deflection:
      a. Remove and replace section. Undamaged pipe may be reused.
      b. Vibratory Rerounding Device:
         1) Use not permitted.

C. Post Installation Hydrostatic Pressure Testing:
   1. Restrain piping and components against movement.
   2. Fill pipe and ensure removal of any air.
   3. Subject pipe to minimum test pressure of 150% of the system design pressure for a period of 4 hours to expand the pipe, adding water as necessary to maintain the test pressure.
   4. At the end of the 4 hour expansion phase, decrease the test pressure by 10 psi and discontinue adding water.
   5. The pipeline must hold the reduced test pressure without the addition of water for a period of 1 hour. Any pressure reduction greater than 5% of the reduced test pressure is considered a failing test.
   6. Under no circumstances shall the total time under test exceed 8 hours. If the test is not complete within this time limit, the test section shall be permitted to relax for 8 hours prior to the next test sequence.

D. Complete Pressure, Leak Tests, Disinfection, Flushing, and Bacteriological Testing in accordance with Division 33 "Water Utilities" requirements.

END OF SECTION 33 05 30

SECTION 33 10 00 – WATER UTILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the furnishing and installation of a water distribution system.

1.3 REFERENCES

A. Except as herein specified or as indicated on the Drawings, the work of this Section shall comply with the following:
   1. ASTM Standard Specifications:
      a. A48 - Grey Iron Castings.
      b. A126 - Grey Iron Castings for Valves, Flanges, and Pipe Fittings.
      c. A167 - Standardized Specification for Stainless and Heat-Resistant Chromium-Nickel Steel Plate, Sheet, and Strip.
      d. A240 - Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels.
      e. B62 - Composition Bronze or Ounce Metal Castings.
      f. B88 - Seamless Copper Tube.
      g. C478 - Precast Concrete Manhole Sections.
      h. C923 -Standard Specification for Resilient Connectors Between Reinforced Concrete manhole Structures, Pipes, and Laterals.
      i. D429 - Rubber Property-Adhesion to Rigid Substrates.
      j. D449 - Asphalt Used in Dampproofing and Waterproofing.
      k. D1248 - Polyethylene Plastics Molding and Extrusion Materials.
      l. D1784 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
      m. D1785 - Standardized Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedule 40, 80 and 120.
      n. D2657 – Standard Practice for Heat Fusion Joining of Polyolefin Pipe.
      o. D2774 - Underground Installation of Thermoplastic Pressure Pipe.
      p. D3035 - Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter.
      q. D3139 - Standard Specification for Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals.
      r. D3261 - Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
      s. D3350 - Polyethylene Plastics Pipe and Fittings Materials.
      t. F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
      u. F714 – Standard Specification of Polyethylene (PE) Pipe (SDR-PR) Based on Outside Diameter.
      v. F1668 – Standard Guide for Construction Practices for Buried Plastic Pipe.
      w. F2164 - Standard Practice for Field Leak Testing of Polyethylene (PE) Pressure Piping Systems Using Hydrostatic Pressure.
      x. F2206 – Standards Specification for Fabricated Fittings of Butt-Fused Polyethylene (PE Plastic Pipe, Fittings, Sheet Stock, Plate Stock or Block Stock.
      y. F2620 – Standard Practice for Heat Fusion of Polyethylene Pipe and Fittings.
   2. ANSI/AWWA:
      a. C104/A21.4 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
      b. C105/A21.5 - Polyethylene Encasement for Ductile-Iron Piping for Water and Other Liquids.
      c. C110/A21.10 - Ductile-Iron and Gray-Iron Fittings, 3-inch through 48-inch, for Water and Other Liquids.
      d. C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings.
      e. C150/A21.50 - Thickness Design of Ductile-Iron Pipe.

f. C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds for Water or Other Liquids.
g. C153/A21.53 - Ductile-Iron Compact Fittings, 3-inch through 24-inch (76 mm through 610 mm), and 54-inch through 64-inch (1,400 mm through 1,600 mm) for Water Service.
h. C301 - Prestressed Concrete Pressure Pipe, Steel-Cylinder Type, For Water and Other Liquids.
i. C304 - Design of Prestressed Concrete Cylinder Pipe.

3. AWWA Standards/Manuals:
   a. C502 - Dry-Barrel Fire Hydrants.
   b. C504 - Rubber-Seated Butterfly Valves.
   c. C506 - Backflow Prevention Devices - Reduced Pressure Principle and Double Check Valve Type.
   d. C511 - Reduced Pressure Principle Backflow Prevention Assembly.
   e. C512 - Standard for Air Release, Air/Vacuum and Combination Air Valves for Waterworks.
   f. C515 - Reduced Wall, Resilient Seated Gate Valves for Water Supply Service.
   g. C550 - Standard for Protective Epoxy Interior Coating for Valves and Hydrants.
   h. C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.
   i. C605 - Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water.
   j. C651 - Disinfecting Water Mains.
   k. C700 - Cold Water Meters - Displacement Type, Bronze Main Case.
   l. C701 - Cold Water Meters - Turbine Type for Customer Services.
   m. C702 - Cold Water Meters - Compound Type.
   n. C706 - Direct-Reading, Remote-Registration Systems for Cold Water Meters.
   o. C800 - Underground Service Line Valves and Fittings.
   p. C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4-inch through 12-inch, for Water.
   q. C905 - Polyvinyl Chloride (PVC) Water Transmission Pipe, Nominal Diameters 14-inch through 36-inch
   r. C906 - Standard for Polyethylene (PE) Pressure Pipe and Fittings, 4-inch through 63-inch for Water Distribution.
   s. M23 - PVC Pipe - Design and Installation.
   t. M55 – PE Pipe – Design and Installation.
4. DIPRA - Ductile Iron Pipe Research Association.
5. NFPA – National Fire Protection Association.
6. National Sanitation Foundation (NSF) Standards:
   a. 14 – Plastic Piping System Components and Related Materials.
   b. 60 - Drinking Water Treatment Chemicals.
   c. 61 - Drinking Water System Components.

1.4 DEFINITIONS

A. Abbreviations:
   1. DI - Ductile iron.
   2. HDPE – High Density Polyethylene Pipe.

1.5 SUBMITTALS

A. Action Submittals:
   1. Product Data:
      a. Pipe.
      b. Gaskets.
      c. Hydrants.
      d. Valves.
      e. Thrust control materials.
      f. Corporation stops.
      g. Curb box.
      h. Curb stop.
   2. Procedures: For flushing, pressure testing and chlorinating. Required Information:
      a. Equipment.
      b. Methods.

B. Informational Submittals: Submit Manufacturer's sworn and notarized statements that the materials furnished comply with this Specification.

1.6 QUALITY ASSURANCE

A. Installation Personnel Qualifications:
   1. Trained and experienced in the installation of the materials.
   2. Knowledgeable of the design and the reviewed Shop Drawings.

B. Water Distribution System: Pressure and leak tests.

C. Water Quality: Bacteriological tests.

1.7 PROJECT CONDITIONS

A. Scheduling of Water Shutoffs:
   1. Approval required.
   2. Not to exceed 4 hours, unless otherwise approve by the Engineer.
   3. Standby service may be required by utility agency.
   4. Required Notice:
      a. Fire Department: 48 hours.
      b. Affected Customers: 48 hours.
      c. If local regulations require more notice, the local regulations shall prevail.
   5. Operation of Existing Valves: By Owner's employees only.

B. Contamination of Existing Lines:
   1. Prevent.
   2. Be responsible for all costs of chlorinating and flushing contaminated lines.

PART 2 - PRODUCTS

2.1 PIPE AND FITTING MATERIALS

A. Ductile Iron Pipe:
   1. ANSI/AWWA C150/A21.50 and C151/A21.51.
   2. Class: 52.
   3. Cement Mortar Lining:
      a. ANSI/AWWA C104/A21.4.
      b. Double thickness.
   4. Meet the requirements of ANSI/NSF Standard 61 and the certification must be stamped on the exterior wall of the pipe.
   5. Joints:
      a. ANSI/AWWA C111/A21.11.
      b. Push-on.
      c. Restrained:
         1) 6-Inch Through 24-Inch:
            a) U.S. Pipe: TR Flex Restrained Joint; Field Lok gasket.
            b) American: Flex-Ring Restrained Joint; Fast Grip gasket.
            c) Clow: Super-Lock Restrained Joint.
            d) Griffin Pipe: Snap-lok restrained joint.
            e) Mechanical joint restraint with Megalugs by Ebaa Iron Sales; or equal.
         2) For pipe sizes greater than 24-inch, joints requiring restraint shall be by manufactured restrained joint pipe.
      d. Lubricant: Provide in accordance with Manufacturer’s recommendation.

B. HDPE Pipe:
   1. Ductile Iron Pipe Size (DIPS), DR 11 (200 psi)
   2. Material Minimums:
      a. High density polyethylene pipe compound molecular weight of 0.941.
      b. Material Designation: PE 4710.
      c. Material Classification: Type III, Class C, Category 5, Grade P34; ASTM D1248.
      d. Cell Classification: ASTM D3350 445574C/E, PE 4710.
      e. Manufacturing Standard: ASTM D3350.

f. Pipe shall contain no recycled compounds except that generated in the Manufacturer's own plant from resin of the same specification from the same raw material.

3. Manufacturers: Poly Pipe, Inc., Performance Pipe, ISCO Industries; or equal.
4. Butt fused joints using equipment and methods in strict accordance with the pipe Manufacturer's recommendations and ASTM D3261 and ASTM D2657

C. Detection Wire:
1. Required for all HDPE Pipe
2. Copper wire, solid or braided, with coating to prevent oxidation and deterioration.
3. Minimum Gage: 12 AWG.
4. 2 wires to be placed slightly above the pipe.

D. Fittings:
1. All fittings shall be restrained to pipe.
2. Ductile Iron Fittings:
   a. 6-Inch Through 24-Inch:
      1) ANSI/AWWA C153/A21.53, compact fittings.
      2) Mechanical joints.
      3) 350 psi pressure rating.
      4) Lining:
         a) Standard thickness, cement mortar lining in accordance with AWWA C104.
         b) Fusion bonded epoxy in accordance with AWWA C550, nominal 6-8 Mils.
   b. Joint Restraint for Ductile Iron Fittings to Ductile Iron Pipe:
      1) 6-Inch Through 24-Inch Pipe:
         a) Mechanical joints with Megalugs by Ebaa Iron Sales; or equal.
         b) Push-on joint with stainless steel gripper gasket.
         c) Restrained joints, as indicated on Drawings, to match restrained joint pipe.
      2) 30-Inch Through 48-Inch Pipe: Restrained joints.
3. HDPE Fittings:
   a. ASTM D3261, F2206, and ANSI/AWWA C906.
   b. Molded or fabricated from polyethylene compound having a cell classification equal to or exceeding the cell classification of the pipe.
   c. Molded Fittings: Pressure rated to match the pipe SDR pressure rating to which they are connected.
   d. Fabricated Fittings:
      1) Made from pipe with a pressure rating at least 25% greater than the pipe to which they are connected.
      2) Angle of bends to have tolerance of ± 1% of required angle.
      3) Field fabricated elbows are not permissible
   e. Pipe Joining:
      1) Pipe to Fitting Joining: Butt fused using equipment and methods in strict accordance with the pipe Manufacturer's recommendations.
      2) Joining Segments of Fabricated Fittings: Butt fused using equipment and methods in strict accordance with the pipe Manufacturer's recommendations.
   f. Transitions from HDPE Pipe to Other Materials:
      1) AWWA C906.
      2) Flanged joint adapter.
      3) Obtain Engineer's review.
      4) Manufacturers: Phillips Driscopipe, Inc.; Chevron Chemical Company; Plexco; or equal.

E. Gaskets:
1. ANSI/AWWA C111/A21.11.
2. Styrene Butadiene (SBR).

2.2 MANUFACTURED UNITS

A. Valves:
1. Manufacturer: EJIW, Clow, US Pipe.
2. Resilient-Seated Gate Valve: AWWA C515:
   a. Nonrising stem.
   b. Wrench nut, 2-inch square.
   c. Open left (counter clockwise).

d. Mechanical joint ends.
e. Stem Seal: Buna-N double O-rings.
f. Body and Bonnet: Ductile iron.
g. Wedge: ASTM D429 rubber coated cast or ductile iron.
h. Coating: AWWA C550 fusion-bonded epoxy.
i. Pressure Rating: 200 psi.
j. Stem: Manganese bronze.

3. Valve Boxes:
   a. Manufacturers and Models:
      1) East Jordan Iron Works 8560 with No. 6 base.
      2) Tyler Pipe, 6860 series with #6 base.
      3) Mueller 10357 with No. 160 base.
   b. 5-1/4-inch shaft.
   c. Three section cast iron.
   d. Cast iron lid marked "WATER".
   e. Adjustable:
      1) By means of threaded top and center sections.
      2) Height: 51 inches to 72 inches.

B. Manholes, Vaults and Chambers:
1. General:
   a. Grade Rings: ASTM C478.
   b. Joints:
      1) 1-inch butyl gasket in flexible rope form.
      2) E.Z. Stik, Butyl-Lok; or equal.
   c. Steps:
      1) Manufacturers: MA Industries, PS-1-PF; or equal.
      2) Steel rod, 1/2-inch, encapsulated in copolymer polypropylene.
   d. Casting:
      1) Manufacturers and Models: Neenah, R-1670; East Jordan Iron Works, 1045.
      2) Solid, gasketed, self-sealing cover.
      3) Imprinted on Cover: "WATER".
   e. Connection Between Manhole and Sewer:
      1) Resilient Connector: ASTM C923 and ASTM A167.
      2) 304 stainless steel bands.
      3) KOR-N-SEAL by NPS, Inc.; or equal.
2. Valve Manholes and Air Release Chambers:
   a. Precast Sections: ASTM C478.
   b. Corporation Stops: Mueller, H-15000; Hays Co., 5200.
3. Valve Vaults:
   a. Precast Sections: C 478.
   b. Waterproofing Bituminous: ASTM D449.

PART 3 - EXECUTION

3.1 EARTHWORK

A. In accordance with Division 31 Section “Excavation and Fill for Utilities.”

3.2 LINE AND GRADE

A. Lay pipe to the grades and elevations indicated on the Drawings.

B. Where No Grades are Indicated:
1. Lay pipe with a minimum of 6-1/2 feet of cover below finish grade.
2. Lay pipe at constant uphill and downhill grades to and from air release valves.
3. Avoid high points except at air release valves.

3.3 INSTALLATION

A. General:
1. Except as herein provided or indicated on the Drawings, install in accordance with:
   a. DI: AWWA C600.
   b. HDPE: AWWA M55.
2. Protect all materials before, during and after installation.
3. Install pipe, fittings and appurtenances in accordance with Manufacturer's recommendations except as indicated herein or on the Drawings.
4. Prevent entrance of foreign materials.
5. Restrain pipe, fittings, valves and couplings as required.

B. Placement of Pipe:
1. Bearing: Support entire length of pipe barrel evenly with extra excavation at joints.
2. Bell and Spigot: Clean and lubricate immediately prior to assembly.
3. Jointing:
   a. Mechanical: Tighten evenly to 75 to 90-foot-pounds of torque.
   b. Restrained: Manufacturer's recommended method.
   c. Fusing: Manufacturer's recommended method.
4. Cutting Pipe:
   a. Power saw.
   b. Ductile Iron and PVC Pipe: Taper cut end by grinding or filing back at least 1/8-inch on a 30 degree bevel.
   c. HDPE: AWWA M55.
5. Thoroughly clean gasket seating surfaces in the socket and on the plain end of the pipe to remove all coating rust and foreign material before use of conductive gasket.

C. Setting Valves and Valve Boxes:
1. Set plumb on 4 inches of compacted 3/8-inch (minimum) crushed stone.
2. Valve Boxes:
   a. Shall not transmit shock to valve.
   b. Plumb over operating nut.
   c. Set cover to finished grade.
   d. Witness.
3. Pressure Tap Sleeve and Valve:
   a. Set at the direction of tapping Subcontractor.
   b. Set and remove tapping machine.

D. Hydrants: Place “Out of Service” placards or labeled bags on pumper nozzle of all hydrants immediately after installation and on all disconnected existing hydrants. Remove after water main is placed in service.

E. Thrust Control:
1. Provide at all fittings.
2. Installation in Accordance With:
   a. Shop Drawings reviewed by Engineer.
   b. Manufacturer's instructions.
3. Restrain all pipe joints within given distance from each fitting (both directions):

Table 1
Length of Restrained Pipe Required

Pipe Diameter	22-1/2 Degree Bends and Less	45 Degree Bends	90 Degrees Bends, Plugs	Tee Run	Tee Branch
6-inch	5-foot	10-foot	20-foot	10-foot	10-foot
8-inch	5-foot	10-foot	25-foot	10-foot	20-foot
10-inch	5-foot	15-foot	35-foot	10-foot	25-foot
12-inch	10-foot	15-foot	40-foot	10-foot	30-foot
16-inch	10-foot	20-foot	50-foot	10-foot	40-foot

F. Placement of Tracer Wire or Pipe Identification Tape:
1. Bury 12 inches above water main.
2. Solder and wrap wire splices.

3. Splice pipe identification tape to ensure continuity of metal foil.
4. Bring wire or tape to surface in valve boxes or as directed by Engineer.

3.4 TESTING AND DISINFECTION

A. Observation: By Engineer.

B. Notification:
1. Pressure Testing: Arrange with Engineer following successful pretesting.
2. Bacteriological Testing: Arrange with Engineer/Owner following successful pressure test.

C. Equipment and Manpower: Provide everything required for testing, disinfection and flushing.

D. Water:
1. To be provided by Owner.
2. Provide temporary connections from Municipal water system to the water main or for hauling water.
3. Provide backflow prevention device.

E. Pressure and Leak Tests for DI and HDPE Pipe:
1. ANSI/AWWA C600.
2. Duration: 2 hours.
3. Pressure:
   a. Maintain 180 pounds per square inch at the average elevation in water main segment being tested.
   b. Do not exceed the pipe's rated test pressure.
4. Water:
   a. To be provided by Owner.
   b. Contractor shall be responsible for providing temporary connections and backflow preventor from Municipal water system for hauling water.
5. Make-Up Water: From measurable source.
6. Maximum Allowable Leakage:

$$L = \frac{SxDxP^{0.5}}{148{,}000} + 0.0078 \text{ gal/hr/in of diameter for each closed valve tested against}$$

L = Leakage in gallons per hour.
S = Length of pipe tested in feet; maximum value 2,000. When length of pipe tested exceeds 2,000 feet, the allowable leakage will be based on 2,000 feet.
D = Pipe diameter in inches.
P = Test pressure: 150 pounds per square inch.

7. Maximum Length of Pipe to be Tested: 2,000 feet, or nearest 2 valves if water on opposite side of valve is not in service.
8. Perform test against tapped cap or plug with a standpipe and not against existing valve if water on opposite side of valve is in service.
9. Repair leaks and repeat tests until acceptable results are achieved.
10. Pressure testing against existing valves not allowed.

F. Disinfection:
1. In Accordance with AWWA C651:
   a. Sodium hypochlorite.
   b. Continuous-feed method.
   c. Calcium hypochlorite granules not required.
   d. Minimum residual 25 parts per million (ppm) initial concentration.
   e. Minimum residual 10 ppm after 24 hours.

G. Flushing:
1. Water main Mainlines: In accordance with AWWA C651.
2. Water Services Into Buildings: In accordance with NFPA 24.
3. Water: Owner supplied.

4. Provide backflow preventor.
5. Velocity:
   a. Water main Mainline: Minimum 3 feet per second in accordance with AWWA.
   b. Water Services (Domestic and Fire Protection): Minimum 10 feet per second in accordance with NFPA.
6. Duration:
   a. Initial: Until entire volume of water in pipeline has been replaced.
   b. Final: Until residual chlorine equals that of adjoining system.
7. Dispose of chlorine residual in accordance with applicable state and local requirements.
8. Disposal location to be inspected by Engineer. If there is any questions that the discharge will harm the environment, apply a reducing agent to the water to neutralize the chlorine to a 1 ppm residual.

H. Bacteriological Testing:
1. In accordance with AWWA C651 and state regulatory agency requirements.
2. Two consecutive bacteriologically safe samples must be taken at 24-hour intervals for each section of pipe tested.
3. Repeat disinfection if bacteriological test fails.
4. Collect Samples from each branch of pipe, and at a maximum spacing of 1,000 feet.
5. Engineer: Transport Samples to lab for testing.
6. Cost of initial and repeat bacteriological lab tests are the responsibility of Contractor.

I. Sequence:
1. Pressure test.
2. Flush.
3. Chlorinate.
4. Flush.
5. Wait 24 hours.
6. Bacteriological sample.
7. Wait 24 hours.
8. Bacteriological sample.
9. Place in service.

END OF SECTION 33 10 00

SECTION 33 40 00 – STORM DRAINAGE UTILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the furnishing and installation of a storm sewer system.

1.3 REFERENCES

A. Except as herein specified or as indicated on the Drawings, the work of this Section shall comply with the following:
   1. ASTM Standards:
      a. A48 - Gray Iron Castings.
      b. A536 - Ductile Iron Castings.
      c. C14 - Concrete Sewer, Storm Drain and Culvert Pipe.
      d. C55 - Concrete Building Brick.
      e. C62 - Building Brick (Solid Masonry Units Made from Clay or Shale).
      f. C76 - Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.
      g. C139 - Concrete Masonry Units for Construction of Catch Basins and Manholes.
      h. C270 - Mortar for Unit Masonry.
      i. C443 - Joints for Circular Concrete Sewer and Culvert Pipe Using Rubber Gaskets.
      j. C478 - Precast Concrete Manhole Sections.
      k. C497 - Method of Testing Concrete Pipe, Sections or Tile.
      l. C822 - Definitions of Terms Relating to Concrete Pipe and Related Products.
      m. C923 - Resilient Connectors Between Reinforced Concrete Manhole Structures and Pipes.
      n. C924 – Standard Practice for Testing Concrete Sewer Lines by Low-Pressure Air Test Method.
      o. C1103 – Standard Practice for Joint Acceptance Testing of Installed Precast Concrete Pipe Sewer Line.
      p. D449 - Asphalt Used in Dampproofing and Waterproofing.
      q. D520 - Zinc Dust Pigment for Paints.
      r. D2412 -Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading.
      s. D3212 - Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
      t. D3350 - Standard Specifications for Polyethylene Plastic Pipes and Fitting Materials.
      u. F405 - Corrugated Polyethylene (PE) Tubing and Fittings.
      v. F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
      w. F449 - Subsurface Installation of Corrugated Thermoplastic Tubing for Agricultural Drainage or Water Table Control.
      x. F667 - Large Diameter Corrugated Polyethylene Tubing and Fittings.
      y. F1417 - Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air.
      z. F2736 - Standard Specification for 6 to 30 in. Polypropylene (PP) Corrugated Single Wall Pipe and Double Wall Pipe.
      aa. F2764 - Standard Specification for 30 to 60 in. Polypropylene (PP) Triple Wall Pipe and Fittings for Non-Pressure Sanitary Sewer Applications.
   2. AASHTO Standard Specifications:
      a. M36 - Corrugated Steel Pipe, Metallic-Coated for Sewers and Drains.
      b. M167 - Standard Plate for Pipe, Pipe Arches, and Arches.
      c. M190 - Bituminous Coated Corrugated Metal Culvert Pipe and Pipe Arches.
      d. M218 - Steel Sheet, Zinc-Coated (Galvanized) for Corrugated Steel Pipe.
      e. M274 - Steel Sheet, Aluminum-Coated (Type 2) for Corrugated Steel Pipe.
      f. M252 - Corrugated Polyethylene Drainage Piping.
      g. M294 - Corrugated Polyethylene Pipe, 12 to 60-inch diameter.

h. M288 - Geotextiles Used for Subsurface Drainage Purposes as modified in MDOT Section 8.09.02.

3. State DOT Current Standards:
   a. Specifications for Construction.
   b. Standard Plans.

1.4 DEFINITIONS

A. Abbreviations:
   1. RCP - Reinforced concrete pipe.
   2. DIP - Ductile iron pipe.
   3. EJ - East Jordan Iron Works.

1.5 SUBMITTALS

A. Action Submittals: For Product Data:
   1. Pipe.
   2. Manholes.
   3. Mandrel.

1.6 QUALITY ASSURANCE

A. Fabrication and Installation Personnel Qualifications:
   1. Trained and experienced in the fabrication and installation of the materials and equipment.
   2. Knowledgeable of the design and the reviewed Shop Drawings.

B. Testing of Material Installation:
   1. Light or reflected light test for alignment.
   2. Visual inspection for leakage and workmanship.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original, unbroken, brand marked containers or wrapping as applicable.

B. Handle and store materials in a manner which will prevent deterioration, damage, contamination with foreign matter, damage by weather or elements, and in accordance with Manufacturer's directions.

C. Reject damaged, deteriorated or contaminated material and immediately remove from the Site. Replace rejected materials with new materials at no additional cost to Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. RCP: Premarc Corporation; Northern Concrete Pipe; or equal.

B. DIP: American Pipe & Supply; American Ductile Iron Pipe; or equal.

2.2 PIPE MATERIALS

A. RCP:
   1. General: Type and class as indicated on the Drawings.
   2. Types:
      a. Concrete: ASTM C 14.
      b. Reinforced Concrete (RCP): ASTM C76.

3. Joints:
   a. Premium: Rubber gasket joints on grooved or stepped pipe ends Lubricants by pipe Supplier.
   b. Geotextile Fabric:
      1) Nonwoven.
      2) Width: 3 feet.
      3) Physical Requirements:
         a) Schedule:

	Geotextile Blanket	Geotextile Blanket with MDOT Class II Backfill
Grab Tensile Strength (Minimum), Lbs.	90	
Trapezoid Tear Strength (Minimum), Lbs.	45	
Puncture Strength (Minimum), Lbs.	45	
Mullen Burst Strength (Minimum), PSI	140	100
Permittivity Per Second, Sec^{-1}	0.5	
Apparent Opening Size (Maximum), MM	0.21	0.30 (Pavement and Foundation Underdrains) 0.60 (Other Areas)

         b) For pipe wrap where backfill around the pipe meets MDOT granular material Class II requirements; geotextiles, including knitted polyester sock, which meet the following minimum requirements in the applied condition area permitted:
            (1) Mass/Unit Area: 3.0 oz/sq. yd.
            (2) Mullen Burst Strength: 100 psi.
            (3) Maximum Apparent Opening Size: 0.30 mm for pavement and foundation underdrains; and 0.60 mm in all other areas.
      4) Manufacturers:
         a) Hoechst Celanese Corporation: Trivira 011/250 .
         b) Amoco Fabric Company: Propex 4553 .
         c) Mirafi, Inc.: Mirafi 180N .
         d) Or equal.
   c. Gaskets:
      1) ASTM C443 .
      2) Furnished by pipe Supplier.
4. End Sections:
   a. As indicated on the Drawings.
   b. Type: Flared end section.

B. Ductile Iron Pipe:
1. ANSI/AWWA C150/A21.50 and C151/A21.51.
2. Class: 52
3. Cement Mortar Lining: ANSI/AWWA C104/A21.4. Double thickness.
4. Joints: ANSI/AWWA C111/A21.11 Push-on.

2.3 MANHOLES, CATCH BASINS AND INLETS

A. Type of Units:
1. As indicated on the Drawings:
2. Precast Reinforced Concrete:
   a. Base Section: ASTM C478, base riser section with integral floor .
   b. Riser and Cone Sections: ASTM C478.
   c. Joints: Premium: ASTM C443, rubber gasket.

B. Hardware:
1. Steps:
   a. General:
      1) 10 inches deep x 10 inches wide.
      2) Tread:
         a) Depth: 5 inches.
         b) Rail Height: 2 inches.
   b. Steel rod, 1/2-inch, encapsulated in co-polymer polypropylene.

2. Castings:
    a. Manholes: Neenah R-1763 R-1784 ; EJIW, 1040A 1060-B ; or equal.
    b. Catch Basins: Neenah R-4340-A; EJIW; 6508 ; or equal.
    c. Curb Catch Basins: Neenah R3033-B, EJIW 7045; or equal.
3. Mortar: ASTM C270, Type M.
4. Brick:
    a. Concrete: ASTM C55, Type I, Grade N.

PART 3 - EXECUTION

3.1 PREPARATION

A. Alignment and Grade:
1. If there is a grade discrepancy or an obstruction which is not indicated on the Drawings, notify Engineer and obtain instructions prior to proceeding.
2. Where Storm Sewer Crosses Water Main:
    a. Expose water main prior to laying storm sewer to verify existing depth.
    b. Maintain minimum clearance of 18 inches unless otherwise indicated on the Drawings or approved by Engineer.
    c. Space joints equidistant from crossing.
3. Control:
    a. Level and Grade Rod: Check line and grade at each structure or cleanout, and 25 foot intervals thereafter.
    b. Laser Beam:
        1) Check Line and Grade At: Set-up point, 25 feet, 50 feet, 100 feet and 100-foot intervals thereafter.
        2) Reset projector at each manhole with a 600 feet maximum.
    c. Allowable Deflection:
        1) Horizontal: 0.20 feet.
        2) Vertical: 0.10 feet.

3.2 INSTALLATION

A. General:
1. Install pipe, fittings and appurtenances in accordance with Manufacturer's recommendations except as herein specified or indicated on the Drawings.
2. Prevent entrance of foreign material.

B. Pipe Laying for Concrete Pipe:
1. Bearing: Support entire length of pipe barrel evenly with extra excavation at joints.
2. Direction: Commence at outlet and proceed up grade with spigot ends pointing in direction of flow.
3. Method:
    a. Wipe clean the socket of pipe last laid.
    b. Center spigot end of pipe to be laid and push home against base of socket.
    c. Center pipe to form a sewer with a uniform invert.
4. Install Polypropylene Pipe in accordance with ASTM D2321 and Manufacturer’s recommendations.
5. Install DuroMaxx pipe in accordance with ASTM D2321 and Manufacturer’s recommendations.

C. Jointing:
1. Mastic:
    a. Surfaces of Joint: Clean and dry before mastic is applied.
    b. Apply mastic to a depth of 1/2-inch or more before placing the pipe.
    c. Take care in laying that the pipe does not shift and that it remains in a home position after assembly.
    d. Remove mastic from inside the pipe for diameters 36 inches and larger.
2. Lubricants: As required for gaskets.
3. Gaskets:
    a. Surfaces of Joint: Clean and dry before lubricant is applied.
    b. Take care in laying that the pipe does not shift and that it remains in a home position after assembly.
4. Geotextile Wrap: Wrap around joint surfaces.

5. Allowable Joint Tolerance:
    a. Maximum: 1/2-inch at newest surfaces of the joint.
    b. Allowable joint tolerance shall not affect the lines and grades and their permissible to tolerances.

D. Manholes:
1. Base Section Placement: Full and even bearing.
2. Precast Units: Mortar joints, lift holes, and around pipes.
3. Block Units:
    a. Block: Set in full bed of mortar with key slots filled.
    b. Joints: Maximum 1/2-inch wide at inside face and wiped.
4. Top of Casting Elevation:
    a. Gravel Areas: 6 inches below surface.
    b. Bituminous Base Course: At base course grade.
    c. Final Wearing Surface:
        1) At finished grade.
        2) Adjustment of castings from base course grade to finished grade is incidental.
        3) Ditches: 6 inches below ditch bottom or protruding not more than 6 inches above slope; as applicable.
        4) Other Areas: As directed by Engineer or indicated on the Drawings.
5. Waterproofing: Prevent visible leakage.
6. Refer to standard detail on the Drawings.

E. Catch Basins:
1. Base Section Placement: Full and even bearing.
2. Precast Units: Mortar joints, lift holes and around pipes.
3. Block Units:
    a. Block: Set in full bed of mortar with key slots filled.
    b. Joints: Maximum 1/2-inch below gutter grade.
    c. Sump: 1/2-inch mortar coat inside and outside.
4. Casting Elevation:
    a. Gutter Area: 1/2-inch below gutter grade.
    b. Other Areas: As indicated on the Drawings or directed by Engineer.
5. Waterproofing: Prevent visible leakage.
6. Refer to standard detail on the Drawings.

F. Connections:
1. To Existing Structures: Relay and repoint loose blocks and bricks as required.
2. For Future Use:
    a. Bulkhead: With 8-inch thick brick and mortar and 1/2-inch plaster outside.

3.3 REPAIR

A. Treatment of Field Welds and Damaged Galvanized Steel Surfaces:
1. Clean with wire brush.
2. Two coats of zinc rich paint conforming to ASTM D520.

3.4 CLEANING

A. Debris: Remove all dirt and debris, including cemented or wedged material from the inside of all sewers, manholes, and catch basins.

B. Final Acceptance: Clean all sewers, manholes, and catch basins before requesting final acceptance.

3.5 TESTING AND INSPECTION

A. Observation: By Engineer.

B. Notification: Arrange for testing with Engineer following backfill, cleaning, and pretesting.

C. Equipment and Manpower: Provide everything required for testing.

D. Alignment and Grade Tests:
   1. Visual:
      a. Each manhole to manhole section.
      b. Mirrors or Lights: Adequate to illuminate the section.

END OF SECTION 33 40 00

SECTION 40 05 62 - AIR RELEASE AND COMBINATION AIR VALVES

PART 1 - GENERAL

1.1 SCOPE

A. This section covers the furnishing of combination air valves as indicated in the Contract Documents.

1.2 REFERENCES

A. Except as herein specified or as indicated on the Drawings, the valves and operators of this Section shall comply with the following as applicable:
   1. ASTM Specification:
      a. A36 - Structural Steel.
      b. A53 - Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
      c. A193 - Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service.
      d. A194 - Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service.
      e. A234 - Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
      f. A283 - Low and Intermediate Tensile Strength Carbon Steel Plates.
      g. A312 - Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.
      h. A403 - Wrought Austenitic Stainless Steel Piping Fittings.
      i. E8 - Low and Intermediate Tensile Strength Carbon Steel Plates.
      j. E23 - Notched Bar Impact Testing of Metallic Materials.
      k. A48 - Gray Iron Castings.
      l. A126 - Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
      m. A153 - Zinc Coating (Hot Dip) on Iron and Steel Hardware
      n. A240 - Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels.
      o. A351 - Steel Castings, Austenitic, for High Temperature.
      p. A436 - Austenitic Gray Iron Castings.
      q. A536 - Ductile Iron Castings.
      r. B21 - Naval Brass Rod, Bar, and Shapes.
   2. AWWA Standards:
      a. C 207 - Steel Pipe Flanges for Waterworks Service - Sizes 4 In. through 144 In.
      b. C 208 - Dimensions for Fabricated Steel Water Pipe Fittings.
      c. C 210 - Liquid Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines
      d. C 219 - Bolted Sleeve-Type Couplings for Plain-End Pipe.
      e. C 606 - Grooved and Shouldered Joints.
      f. C 651 - Disinfecting Water Mains.
      g. C 512 - Air Release, Air/Vacuum, and Combination Air Valves for Waterworks Service.
   3. ANSI/NSF Standards: Standard 61 – Drinking Water System Components.

1.3 GENERAL

A. Equipment provided under this section shall be fabricated and assembled in full conformity with drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Engineer.
   1. Valves and Equipment:
      a. Valves shall be furnished with all necessary parts and accessories indicated on the drawings, specified, or otherwise required for a complete, properly operating installation and shall be the latest standard products of a manufacturer regularly engaged in the production of valves.
   2. Pipe:
      a. Design, fabricate and install according to the references and standards specified herein.
      b. The Drawings indicate general pipe layout only. Details of joints, couplings, tie rods, supports and make-up pieces are not necessarily indicated. Submit proposed details for these components for Engineer's review.
      c. Provide makeup pipe spools, supports and suitable couplings so that piping may be easily separated for removing valves and inline flanged device.

1.4 SUBMITTALS

A. Valves and Equipment:
   1. Shop Drawings:
      a. For equipment assemblies in this Section to include:
         1) Manufacturer.
         2) Model.
            a) Details of construction.
         3) Dimensions, including actuator dimensions and clearances.
         4) Materials of construction.
         5) Listing of components.
         6) Coatings.
         7) Weight of assemblies.
      b. For each type of equipment installed to include:
         1) Itemized listings.
         2) Deviations from the requirements of this Section.
   2. Product Data: For equipment in this Section to include:
      a. Manufacturer.
      b. Model.
      c. Materials of construction.
      d. Manufacturer's engineering and specification data.
   3. Submit pressure, vacuum and temperature ratings of valve.
   4. Installation instructions for equipment in this Section.
   5. Operation and Maintenance Manuals: For equipment in this Section to include:
      a. Copy of reviewed Shop drawings and product/catalog data.
      b. Equipment function, normal operating characteristics and limiting conditions.
      c. Assembly, installation, alignment, adjustment and checking instructions.
      d. Operating instructions for start-up, routine and normal operating, regulation and control, and shutdown and emergency conditions.
      e. Lubrication and maintenance instructions.
      f. Guide to "troubleshooting."
      g. Parts lists and predicted life of parts subject to wear.
      h. Outline, cross-sections, assembly drawings, engineering data, and wiring diagrams.
   6. Certifications/Affidavits: Submit Manufacturer's certification that products and materials conform to these specifications.

B. Pipe:
   1. Itemized Listings:
      a. Equipment to be provided.
      b. Deviations from the requirements of this Section.
   2. Shop Drawings: For equipment assemblies in this Section to include:
      a. Details of construction and installation, including taps, weld-on outlets, water collars, specials, and similar features.
      b. Pipe diameter, wall thickness, length, centerline elevations, and locations and dimensions of valves fittings, taps, and in-line equipment and instruments, and similar features.
      c. Location and centerline elevation of wall sleeves and wall pipes.
      d. Type and location of pipe supports on 8-inch pipe and larger.
      e. Details for concrete pipe supports including dimensions, reinforcement, pipe straps and locations proposed for use.
      f. Type and location of pipe couplings.
      g. Schedule of wall sleeves and pipes indicating proposed sizes, lengths, and connection details.
      h. Preliminary testing schedule showing pipe sections to be tested, bulkheads, drains, and chlorine injection locations.
      i. Schedule of coatings.
   3. Product/Catalogue Data: For all products in this Section to include:
      a. Manufacturer.
      b. Manufacturer's engineering and specification data.
      c. Dimensions, thicknesses, cross-sections, materials of construction.
      d. Coatings.

4. Installation Instructions:
   a. Submit complete Manufacturer's installation instructions for all products.
   b. Submit pipe Manufacturer's recommended span lengths between hangers or supports for each pipe size and type.
5. Certifications: Submit Manufacturer's certification that products and materials conform to these Specifications.

1.5 QUALITY ASSURANCE

A. Fabrication and Installation Personnel Qualifications:
   1. Trained and experienced in the fabrication and installation of the materials and equipment.
   2. Knowledgeable of the design and the reviewed Submittals.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original, unbroken, brand marked containers or wrapping as applicable.

B. Handle and store materials in a manner which will prevent deterioration or damage, contamination with foreign matter, and damage by weather or elements and in accordance with Manufacturer's directions.

C. Reject damaged, deteriorated or contaminated material and immediately remove from the Site. Replace rejected materials with new materials at no additional cost to Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS AND TYPES

A. Provide valves of the size indicated on the Drawings and these Specifications.

B. All valves shall be the Product of one Manufacturer.

2.2 MATERIALS AND FABRICATION

A. Combination Air Valves:
   1. Designed to vent a large quantity of air when present, to softly close tight when liquid enters, and to permit air re-entry when vacuum conditions occur.
   2. Conform to AWWA Standard C512: Air Release, Air/Vacuum, and Combination Air Valves for Waterworks Service.
   3. Materials of Construction:
      a. Body and Cover: Ductile Iron.
      b. Float: Type 316 Stainless steel.
      c. Seat: Buna-N.
   4. Inlet Connection: Threaded, rated for a minimum of 150 psi. Reference Drawings for sizing.
   5. Outlet Connection: Threaded, rated for a minimum of 150 psi. Reference Drawings for sizing.
   6. Operating Pressure: 75 psig or less.
   7. Float: Capable of withstanding 150 psig.
   8. Provide inflow preventer at the air outlet of the air release valve to prevent a cross-connection from occurring if the valve is submerged.
   9. Provide full port isolation brass ball valve supplied by Combination Air Valve Manufacturer.
   10. Provide Two-Way Damper in ventilation piping as specified and indicated on the Drawings.
   11. Manufacturer:
      a. Val-Matic.
      b. Crispin.
      c. Apco.
      d. Or equal.

12. Coating:
    a. Interior Surfaces: Coat in accordance with AWWA C550 using an ANSI/NSF Standard 61 - Potable Water (NSF-pw) listed epoxy; Tnemec; or equal.
    b. Exterior Surfaces (non-immersed): Coat with following non-immersed epoxy system. Coat per manufacturers recommendations:
        1) Surface Preparation:
            a) (Shop): SSPC-SP6 commercial blast cleaning.
        2) First Coat
            a) (Shop and Field Touch-up, Prime): 90-97 Tneme-Zinc, 2.5-3.5 Mils.
            b) Or equal.
        3) Second Coat:
            a) (Field): 69-Hi-Build Epoxoline, 4.0-6.0 mils.
            b) Or equal.
        4) Third Coat:
            a) (Field): 1094 Endura-Shield, 3.0-5.0 mils.
            b) Or equal.

B. Two Way Damper:
    1. Designed to prevent cold air from entering the vault while the air valve is not in operation, while allowing flow in and out of the vault when it is needed.
    2. Provide 100% flow area of pipe when combination air valve is in operation. Allow air valve to function at full rated capacity.
    3. Wafer style bidirectional hingeless damper.
    4. Materials of Construction:
        a. Body: High Density Polyethylene.
        b. Rubber Membrane: Neoprene.
        c. Body Bolt: 316 Stainless Steel.
    5. Make/Manufacturer:
        a. Frost-Safe Two-Way Damper, Val-Matic.
        b. Or equal

C. Carbon Steel Pipe Systems:
    1. Use: Combination Air Valve Vent Piping.
    2. Steel Pipe 4-inch Diameter and Smaller: Schedule 10, ASTM A53, Type E or S, Grade A.
    3. Fabricate and hydrostatically test steel pipe in accordance with AWWA C 200.
    4. Fabricate steel pipe fittings in accordance with AWWA C 208.
    5. Forged Fittings: Conform to ASTM A234.
    6. Drawings indicate flanges at fittings and forged fittings. Welded connections and forged or fabricated fittings are acceptable subject to the proper placement of pipe couplings (flanged, grooved type, or mechanical type) necessary for a proper installation:
        a. Mechanical Couplings: Dresser Style 38; or equal. Provide coupling middle ring at least 7 inches long, with a thickness at least as great as the pipeline of which it is a part. Harness joints in accordance with the Drawings, Specifications, and AWWA Design Manual M-11 for the maximum pressures indicated below:
            1) Combination Air Valve Vent Piping: 50 psi
        b. Grooved end pipe couplings shall be Victaulic Style 77 or Style 07; or equal for steel pipe. 30-inch diameter steel pipe and larger may use Victaulic Style 41 with Type C ends; or equal. Gaskets shall be EPDM and meet service conditions.
        c. Steel Pipe Flanges*:*
            1) In accordance with AWWA C 207.
            2) Class B standard steel ring flanges for:
                a) Combination Air Valve Vent Piping
            3) Class D standard steel ring flanges for other lines.
            4) Flange Gaskets: Full face, rubber, NSF listed for potable water service.
    7. Steel Pipe: Lined with NSF Standard 61 liquid epoxy protective coatings in accordance with AWWA C 210.
    8. Minimum Steel Pipe Wall Thicknesses:
        a. Other Lines: 0.25 inches.

9. Paint outside of pipe, fittings and flanges in accordance with the following non-immersed epoxy system. Coat in accordance with manufacturers recommendations:
    1) Surface Preparation:
        a) (Shop): SSPC-SP6 commercial blast cleaning.
    2) First Coat
        a) (Shop and Field Touch-up, Prime): 90-97 Tneme-Zinc, 2.5-3.5 Mils.
        b) Or equal.
    3) Second Coat:
        a) (Field): 69-Hi-Build Epoxoline, 4.0-6.0 mils.
        b) Or equal.
    4) Third Coat:
        a) (Field): 1094 Endura-Shield, 3.0-5.0 mils.
        b) Or equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Valves and Equipment:
    1. Install in conformance with:
        a. The Shop Drawings reviewed by Engineer.
        b. The Manufacturer's recommendations.
    2. Check and adjust valves, operators and accessories for smooth operation.
    3. Labeling: Provide an engraved stainless steel tag securely fastened to each valve with the valve size, pressure rating, and tag number clearly indicated.
    4. Provide valve actuator Manufacturer’s field service as required to start-up, adjust, participate in control loop tuning, and calibrate all valve equipment.

B. Pipe:
    1. General:
        a. Install process piping and accessories in conformance with:
            1) The Manufacturer's recommendations.
            2) The Shop Drawings as reviewed by Engineer.
        b. Install items to be embedded before concrete is placed.
        c. Fasten embedded items securely to prevent movement when concrete is placed.
        d. Install items plumb, square, true to lines, grades, elevations, and locations as indicated on the Drawings and herein specified.
        e. Do not install chemical piping within finished rooms, regardless of size.
        f. Valves, regardless of size and contents, shall be readily accessible. Chemical feed piping valves shall be accessible from operating floor.
        g. Do not install chemical feed piping over equipment.
    2. Wall Sleeves:
        a. Embed in concrete.
        b. After pipes have been placed through wall sleeves, clean the space between the pipe and the wall sleeve.

END OF SECTION 40 05 62