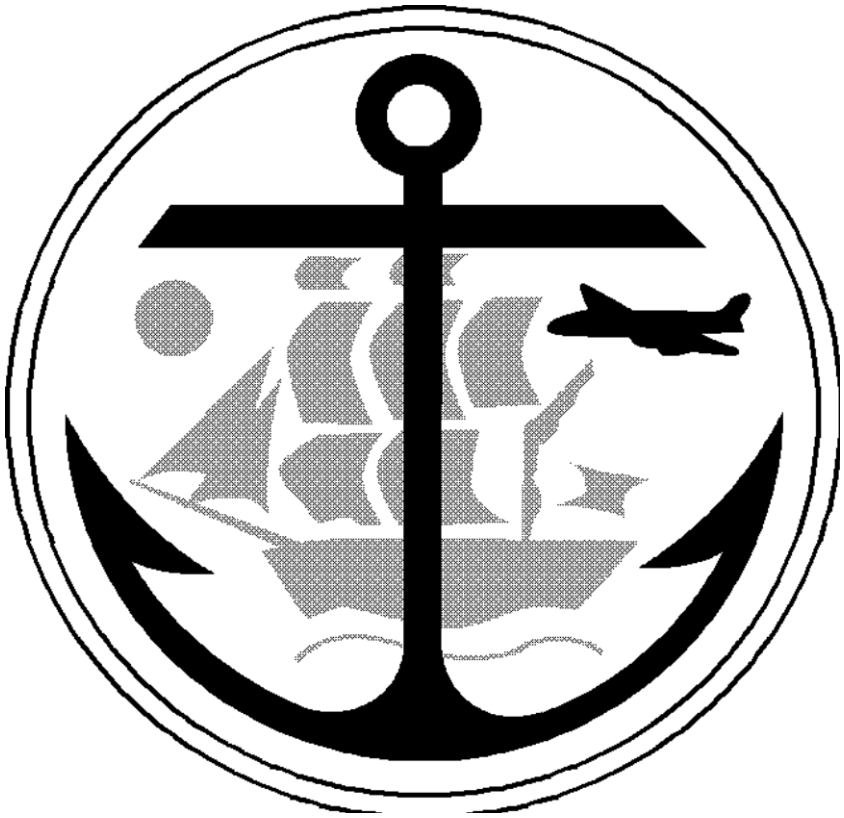
Pump Station 12 Improvements

INVITATION TO BID NO. 2022C035



Municipality of Anchorage
Anchorage Water and Wastewater Utility
3000 Arctic Boulevard
Anchorage, AK 99503

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 SEWER IMPROVEMENTS

PUMP STATION 12 FORCE MAIN / INTERCEPTOR C GRAVITY JUNCTION REHABILITATION

These documents were prepared under the supervision of a registered Professional Engineer.

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 SEWER IMPROVEMENTS

PUMP STATION 12 FORCE MAIN / INTERCEPTOR C GRAVITY JUNCTION REHABILITATION

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Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 SEWER IMPROVEMENTS

PUMP STATION 12 FORCE MAIN / INTERCEPTOR C GRAVITY JUNCTION REHABILITATION

The most current version of the Municipality of Anchorage Standard Specifications (M.A.S.S.) is provided on the Municipality website at

http://www.muni.org/departments/works/project_management/pages/mass.aspx.

Notifications will be sent when updates are made to the document, but each user of M.A.S.S. is responsible to verify that they are using the most current version.

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 SEWER IMPROVEMENTS

PUMP STATION 12 FORCE MAIN / INTERCEPTOR C GRAVITY JUNCTION REHABILITATION

SECTION I

INVITATION TO BID

MUNICIPALITY OF ANCHORAGE
PURCHASING DEPARTMENT

Invitation to Bid

No. 2022C035

Sealed bids will be received in accordance with the time schedule shown below by the Municipality of Anchorage at the Purchasing Department, 632 W. 6th Ave., Suite 520, Anchorage, Alaska 99501 for:

Pump Station 12 Improvements

The work included in this Contract consists of furnishing all labor, equipment, materials, supervision, and other facilities necessary to complete the Work set forth in the Plans and Specifications, and terms of the Contract. Schedule A-Pump Station Rehabilitation to include furnishing and supplying two new pumps and concrete bases, rehab. of two existing pump stands, piping modifications, replacement of sluice gates, replacement of ladders and platforms, sewer flow control, electrical upgrades, well abandonment and new water service, access drive installation, landscaping, new fencing and new gates. Schedule B-Access drives installation, top soil and seeding, and remove and replace fencing and new gate. Schedule C-Force main rehabilitation, installation of new Type B and Type C SSMH's, Cured-in-Place Pipe liner in the 20" and 24" DI force mains, slipline 48" concrete gravity sewer with 36" HDPE, surface restoration, and traffic control. The pump station will be rehabilitated to meet current standards and to enhance operational efficiency.

ESTIMATED CONSTRUCTION COST: **Between: $3,000,000 - $5,000,000**

Site Visit:	**10:00 A.M. Local Time, July 26, 2022** **10:00 A.M. Local Time, July 28, 2022** **4490 Cheveley Circle Anchorage, AK**
Pre-Bid Conference:	**3:30 P.M. Local Time, August 2, 2022**
Questions Due:	**12:00 P.M. Local Time, August 5, 2022**
Bid Opening:	**2:30 P.M. Local Time, August 17, 2022**

All Pre-Bid Conferences and/or Bid Openings may be attended in person or via conference call at this number (907) 343-6089. You may call in five (5) minutes before any scheduled conference. EMAILED BIDS WILL NOT BE ACCEPTED.

ALL QUESTIONS SHALL BE SUBMITTED PRIOR TO THE QUESTION DUE DATE THIS WILL BE THE FINAL OPPORTUNITY TO ASK QUESTIONS OR REQUEST CLARIFICATIONS.

Requests for interpretation or clarification of the bidding Documents shall be made in writing to the Purchasing Office (wwpur@muni.org). Please reference the Invitation to Bid Number & Project Title. Do not contact the specified department directly.

To maintain the project schedule, Interpretations, corrections, or changes to the Bidding Documents shall be made by Addendum and shall not be binding unless included in the Addendum. It is your responsibility to periodically check the website for addenda.

At the above indicated time, the bids will be opened publicly and read. Bids must be received by the Purchasing Officer prior to the time fixed for opening of the bids to be considered. Time of receipt will be as determined by the time stamp in the Purchasing Office.

The Municipality of Anchorage reserves the right to reject any and all bids and to waive any informalities in the bids. No bidder may withdraw his bid after the hour set for the opening of bids or before the award of contract unless said award is delayed for a period exceeding sixty (60) days from the time of the opening.

The Municipality shall not be responsible for bid preparation costs, nor for costs, including attorney fees, associated with any (administrative, judicial or otherwise) challenge to the determination of the lowest responsive and responsible bidder and/or award of contract, and/or rejection of bids. By submitting a bid, each bidder agrees to be bound in this respect and waives all claims to such costs and fees.

Contracts shall be awarded by written notice issued by the Purchasing Officer to the lowest responsive and responsible bidder; however, preference will be given to local bidders in compliance with Anchorage Municipal Code Section 7.20.040.

The Municipality of Anchorage assumes no responsibility for any interpretations or presentations made by any of its officers or agents unless such interpretations or presentations are made by written addendum to this Invitation to Bid.

Bonding Requirements are per MASS/MASS B or as per special provisions

THE MUNICIPALITY OF ANCHORAGE IS AN "EQUAL OPPORTUNITY EMPLOYER"

PUBLISH ONE TIME

Date: July 19, 2022

Senior Buyer Assigned to this Project:
Melanie A Clark

Chris Hunter
Deputy Purchasing Director

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 SEWER IMPROVEMENTS

PUMP STATION 12 FORCE MAIN / INTERCEPTOR C GRAVITY JUNCTION REHABILITATION

SECTION II

SPECIAL PROVISIONS

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 SEWER IMPROVEMENTS

PUMP STATION 12 FORCE MAIN / INTERCEPTOR C GRAVITY JUNCTION REHABILITATION

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Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 SEWER IMPROVEMENTS

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SECTION 100.01 GENERAL STATEMENT AND EXTENT OF WORK

All proposed Work for the Pump Station 12 Force Main / Interceptor C Gravity Junction Rehabilitation is located in Anchorage, Alaska, as shown on the Drawings. The Work included in this Contract consists of furnishing all labor, equipment, materials, supervision, and other facilities necessary to complete the Work set forth in the Plans, and Specifications, and terms of the Contract successfully.

The Work that is presented in the Bid Proposal for this Contract consists of:

1. Schedule A - Pump Station 12 Rehabilitation
    a. Remove two existing wastewater pumps and replace with two new 200 horsepower pumps, with new concrete pump bases and new steel pump stands.
    b. Salvage and reinstall two existing wastewater pumps, with new steel pump stands.
    c. Install new concrete thrust blocks
    d. Piping modifications and new swing check valves
    e. Replace valve control piping and provide standby pressure pump
    f. Replacement of three sluice gates. One new surface actuator and building modifications.
    g. Replacement of ladders and platforms in both wet wells and the influent manhole
    h. Provide all sanitary sewer flow control required to safely complete the Work.
    i. Electrical upgrades with VFD's and new controls
    j. Painting and coating
    k. Water service extension and removal of existing hydropneumatic tank and well abandonment.
    l. Access drive to Turnagain Trunk
    m. Landscaping, fencing, and gates
2. ~~Schedule B – Creek Undercrossing~~ NIC
    a. ~~New 24" DIP and 24" HDPE piping with fittings, thrust blocks, and anchor weights~~
    b. ~~Type C manhole (10' diameter)~~
    c. ~~Removal of existing arch pipe culverts and DIP force main piping~~
    d. ~~Creek diversion and restoration~~
    e. ~~Cathodic protection~~

3. Schedule C – Access Drives
    a. Construction of access drives using classified fill and usable excavation
    b. ~~Placement of rip rap for slope protection~~ NIC
    c. Topsoil and seed
    d. Remove and replace chain link fence and install new gate
4. Schedule D – Force Main Rehabilitation
    a. Construct a type C manhole and associated piping
    b. Construct two type B manholes and associated piping
    c. Lining of 20” and 24” DIP force mains
    d. Slipline 48” concrete gravity sewer with 36” HDPE
    e. Surface restoration
    f. Traffic control

The Work that is presented in the Bid Proposal for this Contract is described in Section III, Technical Specification 01 11 00 – Summary of Work.

It shall be the responsibility of the bidder to prepare the bid so that all materials and working arrangements harmoniously conform to the intent of the Contract Specifications and Special Provisions.

SECTION 100.02 SPECIFICATIONS, CODES, ORDINANCES AND STANDARDS

The Contractor shall perform all Work in accordance with the Contract Documents which include the most current edition of the Municipality of Anchorage Standard Specifications, (hereinafter referred to as M.A.S.S.), and herein revised and supplemented as the Special Provisions.

The Contractor shall perform all Work in accordance with the latest edition of all applicable codes, ordinances, standards, and associated addenda including the AWWU Design and Construction Practices Manual (hereinafter referred to as D.C.P.M.).

The M.A.S.S. and D.C.P.M. are available for download at the following links:

M.A.S.S.
http://www.muni.org/departments/project_management/pages/mass.aspx

D.C.P.M.
https://www.awwu.biz/about-us/reliable-infrastructure/design-and-construction-practices-manual

SECTION 100.03 CHANGES TO MUNICIPALITY OF ANCHORAGE STANDARD SPECIFICATIONS (MASS)

The following enumerated provisions of MASS are amended as hereinafter stated.

DIVISION 10 STANDARD GENERAL PROVISIONS

SECTION 10.01 DEFINITIONS

Add the following item to the list of definitions:

Record Drawings – Detailed drawings that accurately depict all changes in location (both horizontal and vertical), material, equipment, and other elements of Work accomplished by the Contractor. The drawings shall also depict the horizontal and vertical locations of all other utilities and obstructions encountered during construction. Final elevations and locations shall be clearly marked with actual dimensions.

SECTION 10.02 BIDDING REQUIREMENTS AND CONDITIONS

Article 2.1 Examination of Bidding Documents and Site

Add the following paragraph to the end of the Article:

The Anchorage Water and Wastewater Utility performed closed circuit television inspections (CCTV) of portions of both force mains in 2018 and 2019. These inspections were conducted for inspection purposes only. The logs of these inspections are included in Section XIII of these Specifications. DVD disk recordings of these recordings can be picked up free of charge at the Municipality of Anchorage Purchasing Department located at 632 West 6th Avenue, Suite 520, Anchorage, Alaska 99501

SECTION 10.03 AWARD AND EXECUTION OF CONTRACT

Article 3.7 Contractor's Warranty

Delete the first sentence of the first paragraph and replace with the following:

The Contractor shall warranty all materials and workmanship for two (2) years from the Final Acceptance Date.

SECTION 10.04 SCOPE OF WORK

Article 4.8 Work Incidental to the Contract

Delete the numbered item thirteen and replace with the following:

13. Securing, permitting, maintaining, and restoring stockpile/materials staging areas as necessary to complete the Work.
14. Adjustment of valve boxes to finish grade.
15. Connections to existing items specified in the Contract Documents. This includes but not limited to items specified in the Contract Documents as furnish and install pipe connecting to existing pipe, connecting existing pipe to construct sanitary sewer manhole, etc.
16. Conditions of ADOT&PF permits.
17. All Work required to shore, remove, and/or reset light poles and luminaires, including coordinating with Chugach Electric Association.
18. All Work required to shore, remove, and/or reset gas utility amenities including coordinating with Enstar Natural Gas Company.

19. All Work required to shore existing utility facilities.
20. Protecting trees from removal.
21. Tack Coat.
22. Clearing and Grubbing required to complete the project.
23. Removing and resetting gardens, planters, landscaping, retaining walls, play equipment, and other on property improvements and personal property in all areas disturbed by the Work.
24. Removal and disposal of all water/sewer utility amenities to be removed.
25. Permitting fees (except for MOA Building Safety permit)
26. Other items indicated on the Drawings or in these Specifications, but not specifically listed as a bid item in these Contract Documents.

Article 4.12 Public Convenience and Access

Delete the second sentence of the first paragraph and replace with the following:
Without prior approval of the Engineer, entrances or driveways of all kinds shall not be blocked for more than eight (8) hours.

Article 4.13 Traffic Control Plan

Replace the paragraphs five (5) and six (6) with the following:
The Contractor is responsible for obtaining all road closure permits and for complying with all requirements of those permits. Full payment for project traffic control shall be made through bid item entitled "Traffic Maintenance." No other separate payment shall be made.

Add the following paragraph to the end of the Article:
The Contractor shall prepare and submit six (6) copies of an acceptable Traffic Control Plan (TCP) to be employed during construction. The TCP shall be delivered to the Engineer within ten (10) working days of the effective date of the Notice-To-Proceed or five (5) working days before the commencement of Work, whichever is the earlier date. The Engineer will review and accept or reject the plan within five (5) working days of submission. Successive submittals will also be reviewed within five (5) working days. The review by the Engineer is separate from any other agency review.

Article 4.17 Utilities

Add the following sentence to the end of the seventh paragraph:
Utility locates are the responsibility of the Contractor to request, coordinate with the Work, maintain, and protect.

Replace the list of Utility Companies in Article 2.7 E with the following:

Alaska Communication Systems (ACS) – Larry Smith, 564-1812

Alaska Waste – Josh James, 688-4446

Anchorage Water & Wastewater Utility (AWWU) – Joe Sanks, 564-2717

AT&T – Mike Barsalou, 264-7325

Chugach Electric Association (CEA) – Gary Meadows, 242-2191

Eagle River Street & Storm Drain Maintenance – Mark Littlefield, 343-1512

ENSTAR Natural Gas – Stan Staples, 334-7777

GCI Cable – David Blehm, 868-6769

Matanuska Electric Association (MEA) – Tom O'Hare, 761-9281

Matanuska Telephone Association (MTA) – Robbie Nash, 761-2704

Municipal Street and Storm Drain Maintenance – Paul VanLandingham, 343-8372, or 317-7054

Municipal Street Light Maintenance – Kathy Bourque Parker, 343-8242

Municipal Traffic Signals Section – Mike Sickler, 343-8355

Solid Waste Services (SWS) – Evalu Filitaula, 343-6258 or 317-6863

Article 4.19 Record Documents

Add the following sentence to the end of the second paragraph:
Contractor shall also record the location of key boxes, cleanouts, locations of water/sewer service tie-in to water/sewer main, and other information as required. In addition, the Contractor shall record the location of concrete restraint blocks, slipline tie-in locations, and any other locations where the existing DIP force mains (host pipes) have been removed or compromised.

Add the following new Article:
Article 4.22 Responsibility of Contractor to Act in Emergency

In case of an emergency that threatens loss and/or injury of property and/or safety of life, the Contractor shall act, without previous instructions from the Engineer, as the situation may warrant. The Contractor shall notify the Engineer thereof immediately thereafter. Any claim for compensation by the Contractor, together with substantiating documents in regard to expense, shall be submitted to the Owner through the Engineer. The amount of compensation shall be determined by agreement.

The Contractor shall supply the Engineer, prior to commencement of Work, with an emergency telephone number through which a responsible Contractor's representative can be contacted on a twenty-four (24) hour a day basis.

SECTION 10.05 CONTROL OF WORK

Article 5.3 Construction Progress Schedule and Schedule of Values

Add the following paragraphs after the second paragraph:
The Contractor shall also deliver, at the same time as the Construction Progress Schedule, in a form satisfactory to the Engineer, a Schedule of Values detailing the costs of providing all labor, equipment, supplies, transportation, handling, and disposal in connection with the removal of system plant infrastructure as listed in the table below.

Plant system category	Plant system subcategory
Wastewater collection plant	• Gravity sewer main (size) • Sewer force main (size) • Manhole (type) • Cleanout
Sewer pumping plant	• Pump station structure and improvements • Pump station wells • Electric pumping equipment
Wastewater treatment and disposal plant	• Treatment structures and improvements • Treatment and disposal equipment • Outfall sewer lines
Water source supply	• Structures and improvements • Collecting and impound reservoirs • Wells and springs • Supply mains (size)
Water pumping plant	• Structures and improvements (vaults or vertical building) • Electric pumping equipment (pumps, electrical systems) • Diesel pumping equipment • Other power production equipment • Booster pumping equipment
Water treatment plant	• Structures and improvements • Water treatment equipment
Water transmission and distribution plant	• Structures and improvements • Distribution reservoir • Transmission and distribution mains (pipe, valves, pressure reducing vaults) • Services (key box and pipe to main) • Meters • Fire hydrants
General plant	• Structures and improvements

Work items not listed in a subcategory shall be incidental to the subcategory item.

A. Schedule of values format and content:

1. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:

a. Related specification section or division.

b. Description of Work.

c. Name of subcontractor.

d. Name of manufacturer or fabricator.

e. Name of supplier.

f. Change orders (numbers) that affect value.

g. Dollar value (percentage of contract sum to nearest percent, adjusted to total 100 percent).

2. Provide a breakdown of the contract sum in sufficient detail to facilitate continued evaluation of applications for payment and progress reports. Coordinate with the project manual table of contents. Break principal subcontract amounts down into several line items.

3. Round amounts to nearest whole dollar. The total shall equal the contract sum.

4. Provide a separate line item in the schedule of values for each part of the Work where applications for payment may include materials or equipment, purchased or fabricated and stored, but not yet installed.

   a. Differentiate between items stored on-site and items stored off-site. Include requirements for insurance and bonded warehousing, if required.

5. Provide separate line items on the schedule of values for initial cost of the materials, for each subsequent stage of completion, and for total installed value of that part of the Work.

6. Margins of cost: Show line items for indirect costs and margins on actual costs only when such items are listed individually in applications for payment. Each item in the schedule of values and applications for payment shall be complete. Include the total cost and proportionate share of general overhead and profit margin for each item.

   a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be either shown as separate line items in the schedule of values or distributed as general overhead expense, at the Contractor's option.

7. Schedule updating: Update and resubmit the schedule of values prior to the next applications for payment when Change Orders or construction change directives result in a change in the contract sum.

Article 5.4 Non-Working Hours, Holidays, Saturdays, and Sundays

Add the following sentence to the end of the last paragraph:
A standard workday is a ten (10) hour workday (excluding meal times) within the timeframe of no earlier than 7:00 a.m. and no later than 7:00 p.m.

Article 5.5 Shop Drawings

Add the following sentence to the end of the last paragraph:
Reference Section 01 33 00 – Submittals Procedures of the Technical Specifications for additional requirements.

Article 5.6 Product Data

Add the following sentence to the end of the last paragraph:
Reference Section 01 33 00 – Submittals Procedures of the Technical Specifications for additional requirements.

Article 5.10 Subcontracting

Add the following item to the list:

5. The Contractor, at any time after award of contract, proposes to remove or make substitutions for MBE and/or WBE subcontractors or joint-venture partners under the contract, a written notice of such removal or substitution shall be submitted to the AWWU DBE Officer prior to commencement of performance of the affected work, with the names, addresses and phone numbers of the subcontractors or joint venture partners to be removed or substituted for and an explanation of the reasons for the removal and substitution. The Contractor shall make good faith efforts in accordance with the AWWU Disadvantaged Business Enterprise Program Specifications for Utility Contracts to utilize another MBE or WBE subcontractor as the replacement. These efforts shall be documented and the circumstances fully explained in writing, and approval obtained from the AWWU DBE Officer prior to such replacement. The AWWU DBE Officer shall, within seven (7) days of receipt of such notice, approve said notice or removal and substitution where it is shown that the requested action is for good cause and not for discriminatory purposes.NTS: The language highlighted in green must be inserted for EPA State funded projects (Article 5.10).

Article 5.22 Time for Completion of Work

Add the following sentence to the end of the first paragraph:
The Contractor shall complete all Work under this contract within three hundred sixty (360) calendar days of the effective date of the “Notice to Proceed”.

Article 5.27 Liquidated Damages

Delete the first two sentences of the first paragraph and replace with the following:
The Owner may deduct out of any progress payment the sum of Five Hundred Dollars ($500.00) per day as Liquidated Damages for each and every calendar day that the Substantial Completion Date is delayed beyond the Substantial Completion Date specified in Article 5.22, Time for Completion of Work. The Owner may deduct out of any progress payment the sum of Two Hundred Fifty Dollars ($250.00) per day as Liquidated Damages for each and every calendar day that the Final Acceptance Date is delayed beyond the Contract Completion Date.

Add the following new Article:

Article 5.34 Work Plan

Contractor shall prepare a Work Plan for approval by the Engineer prior to beginning construction. The goals of the Work Plan shall include the following:

1. Proper construction sequencing to maintain operation of the pump station during construction.
2. Minimize impacts to vehicular and pedestrian traffic.
3. Maintain a safe transportation corridor through the project area for vehicles and pedestrians.
4. Minimize disruption of vehicular parking for local residents.
5. Minimize dust and erosion generated by construction activities.
6. Minimize overall construction noise.

Contractor shall submit a project Work Plan for approval by the Engineer within 7 days after signature of the Contract. Contractor shall coordinate the Work Plan with the Traffic Control Plan. Work shall not proceed until the Engineer has approved, in writing, the Work Plan. The Work Plan shall include estimated dates of completion for each major task.

No separate payment shall be made for the Work described in this Article and all Work required providing an approved Work Plan is incidental to the Contract.

SECTION 10.06 LEGAL RELATIONS AND RESPONSIBILITIES

Article 6.6 Permits

Add the following sentences at the end of the sixth paragraph:
With the exception of the ADOT lane closure permit, the Contractor shall identify the "Anchorage Water and Wastewater Utility" as the applicant on all permit application forms. The contractor shall apply, for, pay fees and obtain the lane closure permit from ADOT in their name. This permit application will include the traffic control plan and other information as necessary. The Contractor shall submit the application for the lane closure permit at least 30 days in advance of any proposed work to allow time for processing.

Add the following paragraphs to the end of the sixth paragraph:

The existing ADOT Utility Permit is included in the permit section in Chapter XIV Permits of these specifications. A modified permit has been applied for and will be included when it is received by AWWU. An ADNR Temporary Use of Water Authorization (TUWA) permit has been applied for to cover the contractor's undercrossing construction activities. This will also be added tin Chapter XIV when it is received by AWWU.

ADF&G Habitat permit and Special Area permit are also included, as well as an COE 404 permit.

Article 6.9 Insurance

Remove and replace the fifth sentence of the first paragraph with the following:
The insurance company must provide written notification to the MOA contract administrator of any material change, cancellation, or non-renewal of the insurance policies. If the insurer does not notify the MOA in these circumstances, it will be the contractor's responsibility to make that notification.

Article 6.10 Indemnification

Add the following paragraph after the second paragraph:
Assumption and Indemnity. The Contractor shall perform this Contract and carry out its Work and operations related to this Project pursuant to and in conformance with the Utility Permit (Major) (the "Permit") issued by the State of Alaska Department of Transportation and Public Facilities (the "Department") for this Project, a copy of which Permit is attached to this Contract in Section XIV. The Contractor hereby assumes all duties, obligations and liabilities imposed on the Utility Company/AWWU or the Owner/Municipality by the Permit, the Alaska Statutes specified or referred to in the Permit, the terms, requirements and regulations specified or referred to in the Permit, the applicable policies, directives and orders issued by the Commissioner of the Department as referred to in the Permit, and any other obligations or liabilities imposed on Utility Company/AWWU or the Owner/Municipality under any agreement or requirement of Utility Company/AWWU or the Owner/Municipality to indemnify, hold harmless and or defend the Department or the State of Alaska on this Project. In addition, the Contractor shall indemnify, hold harmless and defend Utility Company/AWWU and the Owner/Municipality for any claims, actions, charges, liabilities, obligations, penalties, damages, costs and expenses (including costs and attorney's fees) arising, claimed or charged against Utility Company/AWWU or the Owner/Municipality for damage to property or injury to or death of persons, arising wholly or in part from any action taken by or failure to be taken by the Contractor (including, but not limited to, its employees, officers, agents, contractors, subcontractors, licensees or similar persons), Utility Company/AWWU or the Owner/Municipality in relation to the Project.

Article 6.14 Preference to Local Labor

Add the following paragraph to the end of the Article:
Notwithstanding page ix of the Wage & Hour Administration Pamphlet No. 600 contained in Section VIII of this Invitation to Bid and in accordance with Alaska Statute 36.10.040, this clause does not apply to this Invitation to Bid.

Article 6.15 State of Alaska Prevailing Wage Scale

Add the following paragraph to the end of the Article:
The Contractor, and all Subcontractors, is responsible to identify, pay, and report the higher of the prevailing wage rates on the proper forms. Those wages for which the Federal wage rate is higher, the Contractor, and all Subcontractors, shall report those wages on the Federal forms provided included as part of the Federal wage determination contained elsewhere herein. The Contractor, and all Subcontractors, shall submit the Federal payroll forms directly to the Engineer **weekly**.

Article 6.16 Nondiscrimination

Add the following paragraph to the end of the Article:

The Contractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The Contractor shall carry out applicable requirements of 40 CFR, Part 33 in the award and administration of contracts awarded under EPA financial assistance agreements. Failure by the Contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or other legally available remedies.

Add the following new Article:

Article 6.19 Federal Contract Provisions – Retention of Records

Contractors shall retain all records of this Contract in accordance with 40 CFR 31.36(i)(10) that allows access by the grantee, the subgrantee, the Federal grantor agency, the Comptroller General of the United States, or any of their duly authorized representatives to any books, documents, papers, and records of the Contractor which are directly pertinent to that specific contract for the purpose of making an audit, examination, excerpts, and transactions.

Additionally, Contractors shall, in accordance with 40CFR 31.36(i)(11) retain all required records for a period of three (3) years after grantees or subgrantees make final payment and all other pending matters.

Add the following new Article:

Article 6.20 Federal Clauses Added by Reference

The Contractor shall comply with all provisions of the following federal clauses hereby incorporated by reference:

1. Copeland Anti-Kickback Act.
2. Section 306 of the Clean Air Act.
3. Section 508 of the Clean Water Act.
4. Energy Policy and Conservation Act (P.L. 94-163, 89 Stat.871).

Add the following new Article:

Article 6.21 Federal Certifications

The Contractor shall submit with its bid the following certifications:

1. Certification Regarding Debarment, Suspension, and Other Responsibility Matters (EPA Form 5700-49).
2. Certification of Non-Segregated Facilities.

Add the following new Article:

Article 6.22 Settlement of Procurement Issues and Bid Protests

In addition to Anchorage Municipal Code Section 7.20.130, Appeals, the following applies to this Invitation to Bid:

SETTLEMENT OF PROCUREMENT ISSUES. Grantees and subgrantees alone will be responsible for the settlement of all contracts and administrative issues arising out of procurement. Grantees and subgrantees will have procedures to handle and resolve procurement issues and shall disclose information regarding such issues to EPA. Such issues include, but are not limited to, source evaluation, bid protests, disputes, and claims.

EPA is not a party to any of the grantee's or subgrantee's subagreements for the construction of the proposed project. EPA's funding of this project does not relieve the grantee or subgrantee of any contractual responsibilities under its contracts. Reviews and approvals by EPA are: for administrative purposes only; used to determine compliance with Federal laws and regulations; and used to determine the level of Federal participation.

EPA will not substitute its judgment for that of the grantee or subgrantee unless the matter is primarily a Federal concern. Violations of law will be referred to the local, state, or Federal authority having jurisdiction. Reviews by EPA will be limited to the violations specified below. All other issues received by EPA will be referred to the grantee or subgrantee.

- Violations of Federal law or regulations and the standards. Violations of State or local law will be under the jurisdiction of state or local authorities; and
- Violations of the grantee's or subgrantee's protest procedures for failure to review a complaint or protest.

BID PROTESTS. Grantees and subgrantees will have procedures to resolve bid protest appeals and shall disclose information regarding the protest to EPA and the state. A protestor must exhaust all administrative remedies at the grantee's and subgrantee's level before pursuing a protest with EPA.

Only parties with a financial interest that are adversely affected by the grantee's or subgrantee's decision on the initial bid protest may file a bid protest appeal with EPA. EPA will not substitute its judgment for the grantee or subgrantee unless the matter is primarily a Federal concern. Reviews by EPA will be limited to the violations described under the preceding section entitled "Settlement of Procurement Issues". Violations of law will be referred to the appropriate local or state authority.

Bid protest appeals must be filed with the Office of Regional Counsel, EPA Region 10, ORC-158, EPA, Region 10, 1200 Sixth Avenue, Seattle, WA 98101. A protest appeal must:

- Be a written complaint regarding the grantee's or subgrantee's determination of a bid protest appeal;
- Include a copy of the grantee's or subgrantee's determination of the protest; and
- State the basis for the appeal.

The party filing the bid protest appeal must concurrently transmit a copy of all protest documents and any attachments to all other financially interested parties that may be adversely affected by the determination of the protest appeal.

EPA will only consider written protest appeals received by the Office of Regional Counsel (ORC) within seven (7) calendar days; the adversely affected party can meet the seven day notice requirements by telegraphing or faxing to ORC within the seven calendar day period its intent to file a protest appeal, provided the adversely affected party submits a complete protest appeal within seven (7) calendar days of the date it sent the telegram or fax. If the seventh day falls on a Saturday, Sunday, or holiday, the next working day shall be the last day to submit a protest appeal.

For any protest appeal based upon alleged improprieties in the solicitation that were clearly apparent before receipt of initial proposals, EPA may dismiss as untimely any such appeals if the grantee or subgrantee does not receive the initial protest before bid opening or the closing date for receipt of proposals.

Add the following new Article:

Article 6.23 American Iron and Steel Provisions

All iron and steel products used in the project shall be produced in the United States. The Contractor by signing the Contract acknowledges to and for the benefit of the Municipality and the State of Alaska (State) that it understands the goods and services under this Contract are being funded with monies made available by the Clean Water State Revolving Fund and/or Drinking Water State Revolving Fund that have statutory requirements commonly known as “American Iron and Steel;” (AIS) that requires all of the iron and steel products used in the project to be produced in the United States (“American Iron and Steel Requirement”) including iron and steel products provided by the Contactor pursuant to this Contract. For the purposes of this Article, the definition of “iron and steel products’ means products made primarily of iron or steel; lined or unlined pipes and fittings, manhole covers and other municipal castings, hydrants, tanks, flanges, pipe clamps and restraints, valves, structural steel, reinforced precast concrete, and construction materials that is permanently incorporated into the public water or sanitary sewer system.

The Contractor by signing the Contract represents and warrants to and for the benefit of the Municipality that:

(a) the Contractor has reviewed and understands the AIS Requirement,

(b) all of the iron and steel products used in the project will be and/or have been produced in the United States in a manner that complies with the AIS Requirement, unless a waiver of the requirement is approved, and

(c) the Contractor will provide any further verified information, certification or assurance of compliance with this Article, or information necessary to support a waiver of the AIS Requirement, as may be requested by the Municipality or the State.AWWU may waive this requirement if approved by the Environmental Protection Agency (EPA). Generally, approval by EPA will be granted if the iron or steel products are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality; or if inclusion of iron or steel produced in the United States will increase the overall cost of the project by more than 25 percent. An approval to waive the AIS requirments could take in excess of 21-days for AWWU to obtain from the EPA.

Notwithstanding any other provision of this Contract, any failure to comply with this Article by the Contractor shall permit the Municipality or State to recover as damages against the Contractor any loss, expense, or cost (including without limitation attorney's fees) incurred by the Municipality 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 Municipality). While the Contractor has no direct contractual privity with the State, as a lender to the Municipality for the funding of its project, the Municipality and the Contractor agree that the State is a third-party beneficiary and neither this Article (nor any other provision of this Contract necessary to give this Article force or effect) shall be amended or waived without the prior written consent of the State.

Bidders are encouraged to read the guidance and training materials maintained by EPA at:

https://www.epa.gov/cwsrf/state-revolving-fund-american-iron-and-steel-ais-requirement

The successful Bidder will be required to comply with all record keeping and reporting requirements requiring information from the Contractor under the Clean Water Act/Safe Drinking Water Act, including step certification for AIS compliance.

A sample step certification form is provided in the Section IV of the Contract Documents for use in ensuring compliance with the AIS requirement and is also available on the funding web-link listed above. The Contractor must provide a completed form documenting compliance with the AIS Requirements to AWWU for all AIS products as a submittal prior to material shipment to the jobsite.

SECTION 10.07 MEASUREMENT AND PAYMENT

Article 7.5 Progress Payments

Add the following paragraphs after the second paragraph:

A. Applications for payment

1. Each application for payment shall be consistent with previous applications and payments as certified by the Owner's representative and paid for by the Owner.
    a. The initial application for payment, the application for payment at time of Substantial Completion, and the final application for payment involve additional requirements.
2. Application preparation: Complete every entry on the form. Include notarization and execution by a person authorized to sign legal documents on behalf of the Contractor.
    a. Entries shall match data on the schedule of values and the Contractor's construction schedule. Use updated schedules if revisions were made.
    b. Include amounts of Change Orders and construction change directives issued prior to the last day of the construction period covered by the application.

3. Transmittal: Submit one (1) signed and notarized original copy of each application for payment to the Owner's representative by a method ensuring receipt within twenty-four (24) hours. One copy shall be complete, including OEO reports and similar attachments, when required.
    a. Transmit each copy with a transmittal form listing attachments and recording appropriate information related to the application, in a manner acceptable to the Engineer.
4. Initial application for payment: Administrative actions and submittals, that must precede or coincide with submittal of the first application for payment, include the following:
    a. List of subcontractors.
    b. List of principal suppliers and fabricators.
    c. Schedule of values.
    d. Contractor's construction schedule (preliminary if not final).
    e. Schedule of principal products.
    f. Schedule of unit prices.
    g. Submittal schedule (preliminary if not final).
    h. List of Contractor's staff assignments.
    i. List of Contractor's principal consultants.
    j. Copies of permits.
    k. Initial progress report.
5. Application for payment at substantial completion: Submit an application for payment following issuance of substantial completion.
    a. This application shall reflect certificates of partial substantial completion issued previously for Owner occupancy of designated portions of the Work.
    b. Administrative actions and submittals that shall precede or coincide with this application include:
        i. Occupancy permits and similar approvals.
        ii. Warranties (guarantees) and maintenance agreements.
        iii. Maintenance instructions.
        iv. Changeover information related to Owner's occupancy, use, operation, and maintenance.
        v. Final cleaning.
        vi. List of incomplete Work, recognized as exceptions to Engineer's issuance of substantial completion.

Contractor shall submit, with the first application for payment, a copy of the Notice of Work executed by the State Department of Labor, Wage & Hour Administration. Failure to submit a copy of this form with the first application for payment will result in the withholding of $5,000 from the progress payment. Additionally, a filing may be issued to the Wage & Hour Administration for failure to provide such notice.

Add the following to the list of Withholdings, the fourth paragraph:

6. Failure to submit the detailed Schedule of Values consisting of several elements as required. (The Engineer cannot pay on any of the items specified to be broken down until the breakdown is received and accepted).

7. A maximum of $5,000 for failure to provide a Notice of Work and/or a Notice of Completion as required by Alaska Statute 36.05.045. For final payments, the difference between $5,000 and the actual amount paid for the Notice of Work filing shall be withheld until such time as the Contractor provides a copy of the Notice of Completion executed by the Wage & Hour Administration to the Engineer.

8. The value of items missing by the contract documents. Examples include, but are not limited to, record drawings; operations and maintenance manuals; Department of Labor Notice of Work and/or Notice of Completion, ADEC Notice of Completion form, or other items as listed in the schedule of values or elsewhere required in the contract documents.

Delete the new numbered item eleven and replace with the following:

11. Failure of the Contractor or his/her Subcontractor to file reports with the AWWU Office of Equal Opportunity (OEO) as required by Anchorage Municipal Code, Regulations 7.50.004, 7.50.005, and 7.60.004, and as required by the Special Provisions in a timely manner shall result in monies being withheld in the amount of 10 percent of the amount due the Contractor until such time as the reports have been filed. The required submittals of the Disadvantage Business Enterprise Program, DBE Subcontractor Participation Form (ADEC/EPA FORM 6100-2) shall be made to the Engineer for transmittal to the AWWU OEO Office. Applications for payment will not be considered as having been received by the Engineer unless they are accompanied by a properly completed ADEC/EPA Form 6100-2.

12. Upon receipt of progress billings by Subcontractors, and review and validation by the prime Contractor of satisfactory performance by its Subcontractors, the prime Contractor shall make payment for such work no more than 30 days from the prime Contractor’s receipt of payment for said work from the Owner.

Add the following sentence to the end of the list of withholdings:

Monies withheld under Article 7.5 - Progress Payments, shall be paid to the Contractor by subsequent pay estimates that follow the date on which the Contractor satisfactorily corrects the deficiencies causing the withholding.

Delete the fifth paragraph and replace with the following:
The amount of any withholding for items one (1) through six (6) above shall be the reasonable value of the Work or remedy to be accomplished as estimated by the Engineer, without regard to bid amount of cost to the Contractor. The amount of withholding for items seven (7) through twelve (12) shall be in accordance with the claimed amount or the applicable Contract provisions.

Add the following paragraph to the end of the Article:
The monthly pay estimate shall be computed on the basis of Work completed. All quantities shall be subject to review by the Engineer prior to approval for payment. Monthly price allocation for payment of lump sum items shall be based on the approved construction progress schedule and schedule of values.

The State of Alaska funds this Contract (in part); therefore, the provisions of Alaska Statute 36, Section 36.90, and Article 3 entitled "Public Construction Contract Payment" apply.

Article 7.7 Final Payment

Add the following paragraphs after the first paragraph:
Additional administrative actions and submittals that must precede or coincide with submittal of the final application for payment include the following:

1. Evidence of completion of project closeout requirements.
2. Completion of items specified for completion after substantial completion and all applicable punchlist(s) from the Engineer.
3. Proof that incomplete Work has been completed and accepted by the Owner.
4. Transmittal of required project construction records to the Owner's representative.
5. Removal of temporary facilities and services, surplus materials, rubbish, and similar elements.
6. Change of door and gate locks to Owner.
7. Approved redlines for record drawings.

Article 7.8 Correction of Work after Final Acceptance Date

Delete the first sentence of the first paragraph and replace with the following:
Placement of the Project on warranty shall not relieve the Contractor of his responsibility for paying all costs resulting from defects in materials or workmanship supplied under the terms of the Contract, and for correction of those defects, for a period of two (2) years following the Final Acceptance Date.

SECTION 10.08 FORMS

Delete this Section. All forms required for this Project are provided in Section IV of the Contract Documents.

DIVISION 20 EARTHWORK

SECTION 20.01 GENERAL

Article 1.6 Subsurface Investigation

Add the following paragraph to the end of the Article:
Bore logs ~~in support of the creek crossing~~ are included in Section XII of the Contract Documents.

NIC

A new geotechnical exploration for the remainder of the project was not completed. Soils information from past projects, as shown on AWWU record drawings, are included in Section XII of the Contract Documents. It is important to note these historical borings were conducted prior to construction and do not reflect backfill in the road prism.

SECTION 20.02 STORM WATER POLLUTION PREVENTION PLAN

Article 2.18 Measurement

Delete this Article and replace with the following:
No measurement will be made for Work in this Section.

Article 2.19 Basis of Payment

Delete the first sentence of the first paragraph and replace with the following:
No separate payment will be made for Work in this Section. All Work associated with Storm Water Pollution Prevention Plan will be considered incidental to the Contract.

SECTION 20.04 CLEARING AND GRUBBING

Article 4.3 Measurement

Delete this Article and replace with the following:
No measurement will be made for Work in this Section.

Article 4.4 Basis of Payment

Delete this Article and replace with the following:
No separate payment will be made for Work in this Section. All Work associated with Clearing and Grubbing will be considered incidental to the Contract.

SECTION 20.09 REMOVAL OF PAVEMENT

Article 9.2 Construction

Delete the second paragraph and replace with the following:
Contractor shall keep pavement that is designated for removal free from objectionable material (concrete, steel, etc.) and shall dispose of pavement designated for removal at the Kloep Maintenance Station, 5701 Northwood Street. Contractor shall coordinate

exact location and time of delivery with Paul VanLandingham at 343-8372 or 317-7054 with MOA Street Maintenance. If the removed pavement material under this Section contains objectionable material, as identified by the Engineer, then Contractor shall dispose of this material in accordance with Division 10, Section 10.04, Article 4.9 – Disposal Sites.

SECTION 20.12 DEWATERING

Article 12.3 Construction

Add the following paragraph to the end of the Article:
Trench dewatering shall be required to protect adjacent utilities and property and to install the new utility lines successfully. The Contractor shall provide copies of any and all dewatering permits and approvals to the Engineer.

Article 12.4 Measurement

Delete this Article and replace with the following:
No measurement will be made for Work in this Section.

Article 12.5 Basis of Payment

Delete this Article and replace with the following:
No separate payment will be made for Work in this Section. All Work associated with Dewatering will be considered incidental to the Contract.

SECTION 20.13 TRENCH EXCAVATION AND BACKFILL

Article 13.3 Construction

E. Locator Tape

Delete the fourth sentence and replace with the following:
The Contractor shall install the locator tape at least 24 inches but no more than 36 inches above the crown of the pipe.

Add the following paragraph to the end of the article:

H. Trench Box

Contractor shall obtain and submit to the Engineer the manufacturer's and/or a registered professional engineer's approval when implementing a slope, shoring, and/or shield protections that are not in compliance with occupational safety and health (OSHA) standards. The approval and cost to obtain such approval is incidental and no separate payment shall be made.

No AWWU representative shall enter such trench without the appropriate approvals submitted and received by the Engineer.

When, in the opinion of the Engineer, the slope, shoring and/or shield protections is deficient, inadequate, improper, or conditions exist that safety is would be adversely affected, the Contractor shall be notified by the Engineer. Such notification shall be accompanied by a statement of the corrective action to be taken. If the Contractor fails to promptly comply with such instruction, the Engineer may suspend any or all

Work on the project until satisfactory, corrective action is taken. If the Contractor fails to take such prompt action, the Engineer shall order such Work, as deemed necessary to ensure safety, to be accomplished by an Owner-selected workforce. The cost of this Work shall be deducted from monies otherwise due to the Contractor.

Article 13.4 Measurement

Delete this Article and replace with the following:
No measurement will be made for Work in this Section.

Article 13.5 Basis of Payment

Delete this Article and replace with the following:
No separate payment will be made for Work in this Section. All Work associated with Trench Excavation and Backfill will be considered incidental to the Contract.

SECTION 20.15 FURNISH TRENCH BACKFILL

Article 15.3 Measurement

Delete this Article and replace with the following:
No measurement will be made for Work in this Section.

Article 15.4 Basis of Payment

Delete this Article and replace with the following:
No separate payment will be made for Work in this Section. All Work associated with Furnish Trench Backfill will be considered incidental to the Contract.

SECTION 20.16 FURNISH BEDDING MATERIAL

Article 16.2 Materials

D. Class “E” Bedding

Add the following paragraph to the end of the subarticle:
In addition to the grading limits above, the fraction of materials passing the #200 sieve shall not be greater than 20 percent of that fraction passing the #4 sieve. The material shall not include mechanically fractured materials.

Article 16.4 Measurement

Add the following sentences to the end of the first paragraph:
No measurement will be made for Work in this Section.

Article 16.5 Basis of Payment

Delete this Article and replace with the following:
No separate payment will be made for Work in this Section. All Work associated with Furnish Bedding Material will be considered incidental to the Contract.

SECTION 20.20 UNCLASSIFIED FILL AND BACKFILL

Article 20.4 Measurement

Delete this Article and replace with the following:
No measurement will be made for Work in this Section.

Article 20.5 Basis of Payment

Delete this Article and replace with the following:
No separate payment will be made for Work in this Section. All Work associated with Unclassified Fill and Backfill will be considered incidental to the Contract.

SECTION 20.21 CLASSIFIED FILL AND BACKFILL

Article 21.4 Measurement

Add the following paragraph to the end of the Article:
No measurement will be made for Work in this Section.

Article 21.5 Basis of Payment

Delete this Article and replace with the following:
No separate payment will be made for Work in this Section. All Work associated with Classified Fill and Backfill will be considered incidental to the Contract.

SECTION 20.26 INSULATION

Article 26.4 Measurement

Delete this Article and replace with the following:
No measurement will be made for Work in this Section.

Article 26.5 Basis of Payment

Delete this Article and replace with the following:
No separate payment will be made for Work in this Section. All Work associated with Insulation will be considered incidental to the Contract.

SECTION 20.27 DISPOSAL OF UNUSABLE OR SURPLUS MATERIAL

Article 27.2 Construction

Add the following paragraph to the end of the Article:
If asbestos-cement pipe is encountered and has to be removed from the trench and disposed of, the Contractor is hereby notified that Federal regulations governing the removal and disposal of asbestos are NESHAP 40 CFR, Part 61, Subpart M, and OSHA 29 CFR 1910. The Alaska Department of Environmental Conservation requirements include, but are not limited to 18 AAC 50, Air Quality Control Regulations, and 18 AAC 60, Solid Waste Management Regulations. The Alaska Department of Labor governing regulations include, but are not limited to Occupational Safety and Health Standard, Subchapter 04.0103: Asbestos; 8 AAC 61.600.790 Article 8; and Alaska Workers Right to Know, AS 18.60. Asbestos-cement pipe removed from the trench must be handled

and disposed in accordance with the applicable Federal and State regulations. Asbestos-cement pipe must be disposed of and declared at the Hiland Road Municipal Landfill.

Article 27.4 Measurement

Delete this Article and replace with the following:
No measurement will be made for Work in this Section.

Article 27.5 Basis of Payment

Delete this Article and replace with the following:
No separate payment will be made for Work in this Section. All Work associated with Disposal of Unusable or Surplus Material will be considered incidental to the Contract.

SECTION 20.28 RECONSTRUCT DRIVEWAY

Article 28.4 Measurement

Delete this Article and replace with the following:
No measurement will be made for Work in this Section.

Article 28.5 Basis of Payment

Delete this Article and replace with the following:
No separate payment will be made for Work in this Section. All Work associated with Reconstruct Driveway will be considered incidental to the Contract.

SECTION 20.30 SHORING, SHEETING AND BRACING/SHORING AND SHEETING LEFT IN THE TRENCH AND PORTABLE

Article 30.1 General

Add the following at the end of the Article:
The Work under this Section also includes all operations necessary to shore, brace and protect from harm existing utilities located within the project area. Utilities include underground facilities as well as overhead facilities, utility poles, supporting structures and street lights.

It is the Contractor's responsibility to furnish, install, and maintain wood sheeting, steel sheet piling, shoring, planking, and bracing, whether or not indicated on the Drawings, to prevent earth movement which could damage, but not limited to, adjacent structures and/or property, landscaping, obstruct surface drainage channels or waterways, wetlands, or otherwise impair or delay the work or endanger human life.

Where the centerline of any excavation is within 10 feet of any structure (including but not limited to buildings, retaining walls, manholes, and vaults) in any direction, or the excavation will impact the pressure prism of the adjacent structure foundation, the Contractor shall provide shoring to protect the foundations of the structure.

Where connections of new water/sewer lines to existing water/sewer lines are located within 8 feet of the face of the structure, or the excavation will impact the pressure prism of the adjacent structure foundation, provide shoring parallel to the face of the structure over the entire width of the excavation.

Contractor shall be responsible to repair or replace any portion of any, but not limited to, structures and/or property, landscaping, surface drainage channels or waterways damaged during construction.

A. Measurement to Quantify Structure Settlement

Prior to beginning excavation, the Contractor shall obtain horizontal and elevation survey data for all structural foundation corners for structures within 10 feet of excavation. Structural corners shall include all buildings and retaining walls. The Contractor shall also survey an intermediary point when the structure length or the building wall length exceeds 50 feet. The Contractor shall set PK nails (or approved equal) into the structure to conduct the survey. The Contractor shall provide the Engineer with 24 hours of written notice prior to conducting the survey. The Contractor shall remove targets and restore building surface upon written directive from the Engineer.

Repeat measurements before final completion but after substantial completion. Measurements to be on project horizontal and vertical datum, accuracy 0.01 feet (1/8-inch). Provide daily measurements if signs of settlement are identified.

Submit measurements in table form with point designations, initial locations, subsequent measured locations, dates of each measurement, and differential from original measurement. All survey and submittals shall meet the requirements of Section 65.01 and Section 65.02.

Article 30.3 Construction

Add the following to the end of the Article:
Shoring within the building foundation pressure prism will remain in place to a level one (1) foot above pressure prism. Shoring above this level may be cut off and removed. Do not cut off or remove more shoring than can be completely backfilled within same workday. Bracing may be removed when bracing is not deemed necessary for shoring stability. Ensure bracing removal allows for compaction of soils around bracing. Do not use portable trench to shore building foundations.

The shoring shall be sufficient to avoid impacting areas or facilities outside of the existing ROW, PUEs or TCPs. Methods and materials used to shore or brace utilities shall be reviewed and approved by the affected utility company before it is submitted to the Engineer for approval.

The Contractor shall prepare and submit to the Engineer for approval a Shoring Plan. The Shoring Plan shall be submitted a minimum of three (3) days prior to work involving shoring. The Shoring Plan shall detail the methods and materials to be used for trench shoring as well as utility pole shoring, if necessary. The Plan shall be prepared by and sealed by a Professional Engineer registered in the State of Alaska.

When, in the opinion of the Engineer or affected utility company, shoring is inadequate, improper, or conditions exist such that damage may occur, the Contractor shall be notified in writing by the Engineer. Such notification shall be accompanied by a statement of corrective action. If the Contractor fails to promptly comply with such instruction, the Engineer may suspend any or all Work on the project until satisfactory, corrective action

is taken. Notification or lack of notification shall in no way relieve the Contractor of the responsibilities established in Section 10.04, Article 4.17 - Utilities.

Article 30.5 Basis of Payment

Delete the text of this Article and replace with the following:
No separate payment will be made for Work in this Section. Any single technique or combination of techniques used for Shoring, Sheeting, and Bracing; Shoring and sheeting in the Trench; and Portable Steel Shield will be considered incidental to the items in the Bid Proposal.

DIVISION 40 ASPHALT SURFACING

SECTION 40.11 REMOVE AND REPLACE ASPHALT SURFACING

Article 11.3 Construction

Add the following sentences to the end of this Article:
Contractor shall adjust all utility manhole/valve box rim elevations within the replacement asphalt surfacing in accordance with the applicable Standard Details.

Article 11.5 Basis of Payment

Delete the text of this Article and replace with the following:
No separate payment will be made for Work in this Section. All Work associated with Remove and Replace Asphalt Surfacing will be considered incidental to the items in the Bid Proposal.

DIVISION 50 SANITARY SEWERS

SECTION 50.02 FURNISH AND INSTALL PIPE

Article 2.2 Submittals

Add the following sentences to the end of this Article:
The Contractor shall supply a copy of all permissions to the Utility Company prior to starting Work in the affected areas. The Contractor shall obtain the required sanitary sewer connect permits for service disconnections and reconnections. However, the Utility Company will issue the connect permits at no cost to the Contractor.

Article 2.3 Materials

E. High Density Polyethylene Pipe (HDPE)

Replace the last two sentences of the first paragraph with the following:

> Electrofusion fittings and couplings are not allowed, with the exception that electrofusion branch saddles and electrofusion flex restraints may be used. Electrofusion fittings shall conform to the dimensions of the pipe. The fittings shall be of like materials and have the same pressure rating as the pipe. All fittings shall be installed in accordance with manufacturer's recommendations. For flange connections, use Type 316 stainless steel flange backing plates and fasteners.

Flange backing plates, and associated hardware, shall be tape coated with Densyl tape, or approved equal. Prime surfaces with Denso paste, or approved equal.

All pipe and fittings 2" and larger shall be manufactured to iron pipe size equivalent outside diameter (IPS). Materials shall also meet the requirements found in Section 40 23 40 – Sanitary Wastewater Process Piping of the Technical Specifications.

Article 2.4 Construction

C. Pipe Laying

Add the following sentences to the end of this subarticle:

Tracer wire will not be required in slipline segments of pipe. Where a fitting is provided to change direction, the Contractor is to install a force main angle marker per the detail. The marker must be centered over the fitting.

Add the following subarticle:

H. Connection to Existing Sewer Main

The Contractor shall take all necessary measures to ensure that connection to the existing sewer main does not damage the existing main. The exact connection location to the main shall be determined in the field. Care shall be taken not to damage or move the sewer main while excavating to expose the existing pipe and determine the best connection location for the new to the existing.

Article 2.6 Measurement

Delete this Article and replace with the following:

No measurement will be made for Work in this Section.

Article 2.7 Basis of Payment

Delete this Article and replace with the following:

No separate payment will be made for Work in this Section. All Work associated with Furnish and Install Pipe will be considered incidental to the items in the Bid Proposal.

Add the following new article:

Article 2.8 Qualifications

A. High Density Polyethylene Pipe (HDPE)

The individual who performs the butt-fusion shall have written certification from an HDPE pipe manufacturer stating he/she has successfully completed an 8-hour (minimum) certification class on butt-fusion techniques and procedures. In addition, this individual shall have fused a combined total of more than 5,000 feet of HDPE piping in diameters 4-inches and larger. The contractor shall ensure that each joint is fused at the temperature and pressure recommended by the pipe manufacturer in order to achieve the maximum pressure rating for the joint, and in accordance with ASTM F1290.

All fused joints for HDPE piping and fabricated fittings shall be documented by a computer data logger that records pressure and temperature applied at each fused

joint, along with date and time the joint was fused. Computer printouts, electronic data, and the project station for each fused joint shall be submitted to the engineer. Electrofusion control boxes are required, and shall be calibrated and acclimated. Reference “MAB Generic Electrofusion Procedure for Field Joining of 12 Inch and Smaller Polyethylene (PE) Pipe” by Plastic Pipe Institute for proper electrofusion joining procedures.

The installer of the electrofusion fittings shall have received training approved by the manufacturer and have a strong working knowledge of polyethylene and heat fusion. Before proceeding with branch saddle installation, the installer shall complete a test installation of both sizes of saddles on a similar section of HDPE pipe. The branch saddles shall be tested to 200 psi, and both sizes of fittings shall be sawed in half with a band saw. The test specimens will then be inspected and approved by the engineer and manufacturer representative.

SECTION 50.03 SANITARY SEWER CONCRETE STRUCTURES

Article 3.1 General

Add the following sentences to the end of this Article:
Manholes 78A and 79A are being constructed to provide access to the 24” force main for cleaning and inspection. AWWU O&M has acquired the manholes, DIP pipe, and fittings shown on the Drawings and will provide these materials to the Contractor at the AWWU King Street facility. Any additional DIP piping and fittings, concrete, remove and replace asphalt, insulation, corrosion control, and other appurtenances required to install the manholes, as shown on the Drawings, are considered incidental to this Section and no separate payment will be made.

After construction of manholes 78A and 79A, the Contractor shall provide cleaning and condition assessment of the 24” force main as outlined in Section 50.07 – Sewer Closed Circuit Television Inspections. This CCTV Work will be paid under this bid item.

The construction of Manhole 83 (Type C manhole in Schedule D) will be considered incidental to Section 50.09 – Slipline Sanitary Sewer Gravity Crossing.

Article 3.5 Measurement

Delete this Article and replace with the following:
Measurement of the construction of Manholes 78A and 79A, and the subsequent CCTV inspection, shall be Lump Sum, for all Work necessary to construct the manholes and inspection. The Contractor shall furnish all materials, labor, and equipment for completing the Work including excavation, installation of manholes, installation of piping, fittings, backfill and bedding, surface restoration, sewer line cleaning and CCTV inspection. Any needed repairs to the 24” force main identified during the CCTV inspection will be paid for separately.

Article 3.6 Payment

Delete this Article and replace with the following:
Payment for this Work shall be in accordance with Division 10.00 – Standard General Provisions, Section 10.07 – Measurement and Payment and shall include full payment for all Work described in this Section.

Payment will be made under the following units:

ITEM	UNIT
Construct Sanitary Sewer Manholes (Type B)	Lump Sum

SECTION 50.05 SANITARY SEWER FLOW CONTROL

Article 5.2 Submittals

Replace the entire third paragraph with the following:

The plan, at a minimum, is to include the following items:

- Name and telephone number of the Sewer Flow Control Supervisor, who is responsible for Flow Control
- Pipe and fittings, materials, dimensions and pressure ratings
- Pumping plan
- Restraints and tie-down plan and details
- Plan and profile [drawing] showing air release and drain valves
- Bypass Security, including air release and drain valves
- Bypass start-up plan
- Diagram and state location of provisions being made for vehicular and pedestrian traffic. Provide details of ramps, trenches, temporary surfaces, etc.
- Calculations used to size system.
- Provisions for repair and re-instatement of the sanitary sewer flow control system, including but not limited to back up pumps, repair clamps and extra hosing/piping.

Article 5.4 Construction

Add the following to the beginning of subsection A:

EXISTING CONDITIONS

1. Estimated Flow
    1. Trunk C-5, Campbell Creek Trunk. 48 inch diameter, estimated dry weather average flow 820 gpm, dry weather peak flow 1160 gpm.
    2. Trunk C, Turnagain Trunk. 36-inch diameter estimated average flow 670 gpm, dry weather peak flow 950 gpm.
2. Storm Events—during significant storm events, 2-year reoccurrence or larger, significant infiltration and inflow can occur and flows can increase by a factor of six. The Campbell Creek trunk is especially susceptible. Normal pump station operation with both wetwells and all four pumps shall be restored when a large storm event, 1 year reoccurrence or greater is forecast.
3. Pumps

1. All four existing pumps are operable, but it is not uncommon for one of the pumps to be out of service.
2. The two ABS pumps, pumps 2 and 3 were installed in 2012, they are more resistant to clogging and they are considered the more reliable pumps.
3. The two Worthington pumps, pumps 1 and 4 are older, part of original construction, they are still considered reliable, but they are more prone to clogging if a high solids load is encountered.

4. Storage in influent pipelines—The 48" and 36" influent pipe lines are both deep and afford significant storage before flooding the lowest service. Estimated available storage:
    1. Campbell Creek Trunk, from elevation -1.6 ft msl, current "pump on" elevation to 13.0 ft msl, the highest safe elevation. Estimated pipeline volume 950,000 gal.
    2. Turnagain Trunk, from elevation -1.6 ft msl, current "pump on" elevation to 13.0 ft msl, the highest safe elevation. Estimated pipeline volume 470,000 gal.
    3. Maximum level allowed in Campbell Creek Trunk, 13.0 ft msl, Estimated volume 950,000 gal
    4. Maximum level allowed in Turnagain Trunk, 13.0 ft msl, Estimated volume 470,000 gal
5. Sludge and sediment in pipelines—due to low flow velocities in the influent pipelines, a significant quantity of sludge and sediment has been deposited in the pipelines. When pumping down water stored in the pipelines or other high flow events, higher flow velocities can cause this sludge to mobilize and a significant solids load can be encountered at the pump station. This solids load can cause pump clogging and downstream treatment problems. The contractor shall avoid high pump rates and high flow rates that cause the sludge mobilization.
6. The liquid level in the wet wells should not be pumped below, -7.0 ft msl (4 ft above pump intake) to avoid vortexing and air locking the pumps.

Add the following to the end of subsection A:

The Contractor, at a minimum, is to provide periodic monitoring and observations of any active sewer flow control. The maximum period between observations is limited to two hour and is to be recorded in a log book that is available to the Engineer.

In addition to having the bypass system monitored, the Contractor is to provide to the Engineer the name and 24-hour contact number for the person(s) responsible for continuous operation of the bypass system. This person is to be known as the Sewer Flow Control Supervisor. After approval of the sewer flow control plan, any substitutions of the Sewer Flow Control Supervisor is to be approved by the Engineer.

The Contractor shall provide a locking mechanism for all exposed air release and drain valves.

The Contractor is to provide a sewer flow control plan showing all components of the sewer slow control equipment, materials, location, personnel and schedule. The following example bypass sequence is intended as a starting point to assist the contractor in developing the sewer flow control plan:

1. Rehabilitate Influent Manhole
    a. Close 36” sluice gate which feeds Wet Well #2
    b. Using two pump systems, bypass pump from MH 1(Turnagain Trunk) and MH 38 (Campbell Trunk to Wet Well #2
    c. Continue PS12 operation using Wet Well #2.
        i. The pump start and stop levels can be adjusted to provide a comfortable pump cycle time, 10 minutes or more.
        ii. When the 36” sluice gate feeding Wet Well #2 has to be replaced:
            1. Set pump start elevation at -5.0 ft msl (24” SCADA), below 36” sluice gate elevation.
            2. Employ intermittent bypass pumping to use the pipeline storage capacity to allow slice gate replacement work.
            3. During periods when pumping is shut down, the contractor shall actively monitor upstream water levels in the sewer system to be sure the maximum levels are not exceeded.
2. Rehabilitate Wet Well #1
    a. Close 36” sluice gate feeding Wet Well #1, open the gate to Wet Well #2 and divert flow to Wet Well #2.
    b. Resume normal Operation of PS12 using Wet Well #2 and pumps #3 and #4.
3. Rehabilitate Wet Well #2
    a. Close 36” sluice gate feeding Wet Well #2, open the gate to Wet Well #1 and divert flow to Wet Well #1.
    b. Resume normal Operation of PS12 using Wet Well #1 and pumps #1 and #2.
    c. When replacing the 24” sluice gate:
        i. The bottom elevation of the 24 in sluice gate is near the minimum pump down level. This replacement will have to be done by blocking the influent flow and shutting down the pump station. The pump station can be shut down for approximately 8 hr, (dry weather).

ii. Close the 36” gate feeding Wet Well #1 use the storage in the influent pipelines to provide work periods in Wet Well #2 to complete the 24”gate replacement.

iii. During periods when pumping is shut down, the contractor shall actively monitor upstream water levels in the sewer system to be sure the maximum levels are not exceeded.

A. Conduits

Replace the third paragraph in this subsection with the following:

When conduits cross roadways or driveways, the conduit is to be buried or routed through culverts.

Remove subsections C, D, and E and replace with the following:

B. Notifications

Notification is to be given to the sewer utility, Property Owner(s), business manager(s), and Resident(s) whose sewer service is being plugged, bypassed, or affected by the planned sewer flow control. Notices are to be provided a minimum of seventy-two (72) hours to a maximum of one hundred forty-four (144) hours prior to commencement of the flow control. Notices at a minimum will require a written statement of when utility interruption will begin and end along with twenty-four hour (24 hr) emergency contacts.

C. Air Release and Drain Valves

Manual air release valves will be provided at all high points in the force main bypass. Drain valves will be provided at all low points. Air valves shall be large enough to vent air without clogging. Drain valves shall be large enough to drain wastewater during maintenance or decommissioning without clogging. Outlets shall be fitted with camlock connections to facilitate vactor evacuation of the pipe.

D. Bypass Force Main Flow Splitter

Each pump system shall be fitted with a flow splitter and valves that will allow directing the flow to either of the wetwells without having to modify the piping.

Article 5.5 Measurement

No measurement will be made for work in this section.

Article 5.6 Payment

No separate payment will be made for Work in this Section.

All Work associated with Sanitary Sewer Flow Control will be considered incidental to item 50.11 – Pump Station 12 Improvements.

SECTION 50.07 SEWER CLOSED CIRCUIT TELEVISION INSPECTIONS

Article 7.1 General

Add to the end of Article 7.1:
Closed circuit television (CCTV) inspection will be required for designated sections of the 24" force main (using new manholes 78A and 79A) and sewer gravity crossing (Reference 50.09 – Slipline Sanitary Sewer Gravity Crossing). The CCTV inspection will meet the requirements of "Condition Assessment" and "Pre-rehabilitation" under Article 7.4 CONSTRUCTION.

Article 7.4 Construction

Add at the start of the Paragraph B Sewer Cleaning:
Sewer cleaning will be required to provide a good video record of pipe condition and also to allow the subsequent slipline of the pipe. This may require excavation and removal of pipe sections to accomplish debris removal.

Cleaning work shall meet the requirements in Section 50.15 – Sewer Line and Wet Well Cleaning.

Article 7.6 Basis of Payment

Replace the entire Article with the following:
Payment includes all labor, tools, equipment, apparatus and incidentals required to complete the Work. At a minimum, no additional payment will be granted for setups, reverse setups, tear downs, relocation, overlapping video footage per bid item, lost or damaged equipment, property owner coordination, and jetting during CCTV activities.

All CCTV Work associated with the condition assessment of the 24" force main and the installation of Manhole 78A and 79A will be considered incidental to Section 50.03 – Sanitary Sewer Concrete Structures.

All CCTV Work associated with Slipline Sanitary Sewer Gravity Crossing will be considered incidental to Section 50.09 – Slipline Sanitary Sewer Gravity Crossing.

Add the following NEW Sections:

SECTION 50.09 SLIPLINE SANITARY SEWER GRAVITY CROSSING

Article 9.1 Description

Where indicated on the drawings, perform sliplining of an existing sewer gravity main crossing Dimond Blvd. with high density polyethylene (HDPE) pipe and reconnecting to the dual force mains. The Contractor shall furnish all materials, labor, and equipment for completing the work including sewer line cleaning, CCTV inspection (pre and post), liner pipe installation, casing spacers, annular space grouting, traffic control, remove and replace asphalt, new manhole (type C) with beaver slides, reconstruction of manhole #10, new piping to connect force mains, reinstallation of gate valve, pipe abandonment, and surface restoration.

Indications are that the existing 50-year old 48-inch Reinforced Concrete pipe is in poor condition. The project is intended to extend its service life. Pipe integrity will be a priority.

Article 9.2 Submittals

Submit the following for review and approval by the Engineer:

1. Shop drawing for proofing pig
2. Work plan for installing the HDPE pipe in place
3. Pipe, valves, fittings, and materials
4. CCTV Inspection, reports, and DVD's
5. Pressure test results
6. Safety Plan
    a. Confined Space Permit under Occupational Safety and Health Administration (OSHA) Standards 29 CFR 1910.146

Article 9.3 Definitions

1. **Sliplining**: Sliplining is a pipe rehabilitation process that involves the insertion of a new pipe of smaller diameter into an existing pipe.
2. **Host Pipe**: The original existing old pipe that will be rehabilitated with the sliplining process.
3. **Product Pipe**: The new pipe that is inserted into the host pipe. This is also called the **Liner Pipe**.
4. **Insertion Pit**: The pit where the sliplining begins and where the product pipe is inserted into the host pipe.
5. **Annular Space**: The space or gap between the product pipe and the host pipe.
6. **Springline**: Mid-point or halfway up the pipe cross-section where the pipe is at its maximum horizontal dimension or defined as the mid-point between the pipe invert and pipe crown.

Article 9.4 Materials

The pipe shall be high density polyethylene (HDPE) pipe. The pipe shall meet the requirements of Section 50.02 - FURNISH AND INSTALL PIPE and Section 40 23 40 – Sanitary Wastewater Process Piping of the Technical Specifications and shall meet the dimensions identified in the drawings.

Article 9.5 Construction

A. General

All pipe shall be installed in conformance with the pipe manufacturer's recommendations.

B. Work Plan for Installing HDPE Pipe In Place

The Contractor shall submit a Work Plan to the Engineer for approval a minimum of 60 calendar days prior to the start of the sliplining work. Allow 21 calendar days for the Engineer's review. Included in the Work Plan will be:

1. Insertion pit locations and layout
2. Active pipe restraint at insertion pits
3. Pull force calculations and Manufacturer's allowable pull force
4. Winching plan
5. Liner pipe staging and layout plan
6. Detailed list of tasks and order of work
7. Schedule
8. Traffic Detour and Access Plan
9. Public Involvement Plan
10. Quality Control Plan
11. Interim Pressure Test Plan
12. The plan to equalize and normalize pipe stress along the liner pipe. Provide supporting calculations.

Following approval of the Work Plan, the Contractor shall apply for and obtain Right-of-Way Permit and Traffic Control Permit from ADOT&PF.

The following is an example sequence of construction:

- *20" force main in use—Dimond Blvd, all lanes open, Carr's west driveway access open*
    1. Shut down 24" force main, drain and close gate valve at Sta 35+59
    2. Install Manholes 78A and 79A, owner supplied major materials.
    3. Closed circuit TV inspect 24" force main Sta 7+00 to Sta 32+44
    4. Sta 32+09 to Sta 32+44, replace 24" DI pipe with 24" PVC pipe. Do not install 90°bend
    5. TV inspect 24" PVC force main from Sta 32+09 to Sta 32+44
    6. Sta 35+59, dig-up 24" gate valve, disconnect and temporarily remove a section of downstream pipe
    7. Sta 32+34 (32+44) to Sta 35+59, CIPP line 24" DI pipe. Preserve gate valve. ~~Use CIPP Staging Area #1 shown on sheet R10.~~
    8. TV inspect 24" force main from Sta 32+34 to 35+59
    9. Sta 32+34, Install 24" 90° bend and thrust block.
    10. Sta 35+59, Reconnect existing 24" force main down stream of gate valve

11. Complete spot repairs (if any) on the 24” force main
12. Fuse 36” HDPE slipline carrier pipe in the Slipline Staging Area ~~#2~~
13. Attach casing spacers to slipline carrier pipe

- *24” force main in use— Dimond Blvd, all lanes open, Carrs west driveway access open*
  1. Open valves and start 24” force main, shut down 20” force main, drain and close gate valve at Sta 35+92.
  2. Complete spot repairs on the 20” force main
  3. Sta 32+09 to Sta 32+49, Replace 20” DI pipe with 20” PVC pipe. Do not install second 45° bend.
  4. TV inspect 20” force main from Sta32+09 to Sta 32+49
  5. Sta 35+68, dig-up 20”, cut pipe and temporarily remove section of downstream pipe
  6. Sta 32+49 to Sta 35+68, CIPP line 20” DI pipe.
  7. TV inspect 20” force main from Sta 32+49 to Sta 35+68
  8. Install second 45° bend at Sta 32+49, pour thrust blocks at both 45° bends.
  9. Fabricate temporary pipe connection from end of 20” at Sta 35+68 to insert into the end of the 36” HDPE at proposed MH83.
- *24” force main in use— **Activate traffic control plan**. Dimond Blvd, Single lane each way, Carrs west driveway access closed, ~~Occupy Slipline Construction Area #3~~ (see sheet R10)*
  1. Excavate and dismantle MH 10 as required
  2. Excavate and expose existing junction box at Sta 36+18
  3. Excavate for and set base for MH 83, proposed junction manhole
  4. Excavate slipline approach trench and rig for sliplining
  5. Preliminary clean 48” concrete sewer at Dimond Blvd under crossing
  6. Pump down PS12 wet well to minimum elevation
- *Shut off PS12, 8 hours max — Dimond Blvd, Single lane each way, Carrs west driveway access closed*
  1. Clean 48” concrete pipe
  2. Demo existing junction box, Sta 36+18
  3. Slipline 48” concrete pipe, Sta 36+18 to Sta 36+96
  4. Verify alignment of casing spacers and block ends of carrier pipe.
  5. Install manhole rings on proposed MH 83 as practical.

6. Install temporary pipe from end of 20” force main (Sta 35+68) into south end of 36” slipline carrier pipe at MH83.
7. End PS12 shutdown. Start PS12, shutdown 24” force main and start-up 20” force main

- *20” force main in use — Dimond Blvd, Single lane each way, Carrs west driveway access closed*
  1. Start PS12 and operate with one pump at normal wet well elevations and cycling
  2. Grout slipline annular space
  3. Verify carrier pipe elevations and slope.
  4. Reconstruct MH10, Sta 36+96, final grading and paving
  5. Connect 24” PVC from to end of 24” force main at Sta 35+59, extend to Junction Manhole, MH 83 at Sta 36+00
  6. TV inspect 24” force main from Sta 35+59 to MH83
  7. MH83, Trim pipes to the extent possible and grout manhole channels leaving temporary pipe from 20” force main in place.
  8. After grout has set, switch over to 24” force main
- *24” force main in use — Dimond Blvd, Single lane each way, Carrs west driveway access closed*
  1. Run with 24” force main, continue to operate PS12 with one pump at normal wet well elevations and cycling
  2. Slurry grout force main segments that will be abandoned in place.
  3. Extend 20” PVC from the end of 20” force main at Sta 35+68, to Junction Manhole, MH 83 at Sta 36+00
  4. TV inspect 20” force main from Sta 35+68 to MH 83
  5. Finish grouting and trimming MH 83
  6. Finish construction of MH 83
  7. Apply internal coating to MH 83 above high-water line.
  8. Finish grading and paving MH 83
- *Shut-off PS12 for 8 hour maximum*
  1. Apply internal coating to MH83 below high water line. Steam clean and dry as required.
- *Final inspection, testing, and commissioning for both force mains*
- *Open all lanes Dimond Blvd and open Carrs west driveway*

C. Sewer Cleaning and CCTV Inspection

Clean the host pipe as required in accordance with Section 50.15 - SEWER LINE AND WET WELL CLEANING and perform a pre-rehabilitation CCTV inspection in accordance with Section 50.07 - SEWER CLOSED CIRCUIT TELEVISION INSPECTION.

D. Sewer Proofing

After CCTV Inspection, if there is any sign of damage, deformed pipe or any notable deficiencies the Contractor shall pull a sizing or proofing liner through the 48-inch host pipe. This shall be done prior to insertion of the liner pipe to verify adequate clearance is available to insert the liner pipe. The proofing liner shall have the same diameter dimensions as the product pipe and shall be fitted with a pulling head and cable on both ends. The proofing pig shall be no less than 10 feet long. Pull heads shall be made of material which will not damage the host pipe. The Contractor shall be responsible for all costs incurred in retrieving the proofing liner. The host pipe shall be considered ready for sliplining when, after proofing the host pipe for the area to be sliplined, the proofing liner shows no evidence of excessive cuts, kinks, gouges or other damage.

No sliplining shall be performed until the sewer has been successfully proofed. Where the host pipe is unacceptable for sliplining due to the inability to complete proofing, the Contractor shall inspect the host pipe with a CCTV camera and determine the location(s) where repair(s) or additional cleaning is needed. The Contractor shall notify the Engineer immediately, if inspection or proofing reveals an obstruction that will restrict insertion of the segmented liner and cannot be removed by conventional sewer cleaning equipment.

E. Joining Pipe

Pipe joining shall be accomplished in accordance with the pipe manufacturer's recommendations and MASS Section 50.02 - FURNISH AND INSTALL PIPE. Follow manufacturer's recommendations for making field cuts and field connections where the product pipe is connected in the insertion pit after sliplining insertion is complete.

F. Insertion Pits

The liner shall be installed through insertion pits at locations selected by the Contractor and approved in the Work Plan. The Contractor shall submit for approval any changes in the location or dimension of the pits. All pits shall be adequately shored, braced, and dewatered to ensure safe work areas. The pits shall be sloped according to the manufacturer's recommendations to facilitate entry of the liner pipe without damage. The pit shall be shaped such that the radius of the HDPE liner bend is not less than 30 times the outside diameter of the liner pipe.

Excavation for and backfill of the insertion pits shall be in accordance with Section 20.13 - TRENCH EXCAVATION AND BACKFILL. Insertion pit length shall be constructed for the minimum size necessary for the insertion of the liner pipe. Sheeting, shoring and bracing requirements shall be in accordance with Section

20.30 - SHORING, SHEETING AND BRACING/SHORING AND SHEETING LEFT IN THE TRENCH AND PORTABLE.

Insertion pit excavations shall be performed at all points where the liner pipe will be inserted into the existing force main. At insertion pits, the top of the existing sewer shall be removed down to the springline. The edge of the existing pipe shall be smoothed to eliminate sharp edges that could damage the liner pipe.

G. Active Pipe Restraint

The Contractor shall definitively show in the Sliplining Work Plan the proposed methods for restraining the active force mains during all phases of construction. It is of the upmost importance to ensure a safe and environmentally secure work area.

Pipe restrain methods, materials and details shall be submitted as part of the sliplining work plan. These methods shall include the proposed method for installing the necessary restraints during initial excavation and methods of abandoning the anchors when the insertion pit is backfilled. These methods shall provide necessary pipe restrain while the anchors are being placed and removed. Each soil anchor shall be proof tested as part of original installation and a record of the proof tests shall be submitted to the engineer before the active force main is exposed.

When pipe insertion is complete and the insertion pit is being backfilled, the contractor shall remove the pipe anchor cables from contact with the force main pipe to prevent future pipe damage from abrasion or corrosion.

H. Liner Insertion

Pipe shall not be installed if the condition of the existing sewer line is unsuitable.

The liner pipe shall be pulled, or pulled and pushed, into the existing force main. For each section to be lined, insertion shall be one continuous operation until the planned termination point is reached.

The Contractor shall not stretch the HDPE pipe beyond its elastic limit in the event of a hang-up.

After insertion, the manufacturer’s recommendations shall be followed regarding relaxation of the liner prior to installation of restraints and grouting.

The Contractor shall allow the liner to return to its original length and shape in the unstressed state and then trim the excess liner for connection to the pipe system. The liner manufacturer’s recommendations shall be followed regarding the relief and normalization of stress and strain due to temporary stretching after pulling operations are completed. Time allowed for stress and strain relief shall not be less than 24 hours. The ultimate goal is to have the liner pipe in a slight state of tension over the entire length at normal operating temperature and pressure.

Liner pipe connections in the insertion pit after the liner is in place will be accomplished using fused flange adapters.

Equipment employed in the sliplining shall conform to the requirements below and shall be approved by the Engineer and the pipe supplier.

A hydraulic, mechanical, or cable-operated winch along with an excavator to aid in pushing the liner pipe may be used. The machine operator must closely and continuously monitor and control the pulling load imposed on the liner pipe. A pulling head with a swivel shall be used to distribute the pulling load evenly on the liner pipe.

Construct a bulkhead at the insertion pits and vault connections in order to seal the annular space during annular space grouting. Bulkheads shall be watertight and can be constructed of cement grout, chemical grout, activated oakum, or other approved method. Contractor shall submit bulkhead design prior to beginning the Work in this Section.

Fill the annular space with grout as required and described in Section 50.10 - ANNULAR SPACE GROUTING G1.

I. Backfill at Exposed Liner

At all points where the liner pipe is exposed, the Contractor shall remove all debris and bed and backfill around the pipe as shown on the drawings. Backfill to required grade shall be placed and compacted in accordance with Section 20.13 - TRENCH EXCAVATION AND BACKFILL.

J. Check Line and Grade

After backfilling and cleaning, but before final acceptance, all sections of installed line are to be checked for line and grade. A physical inspection of the interior will be made before acceptance. Any excess deviation in line and grade must be corrected by the Contractor prior to Final Acceptance of the Project. Line and grade may be checked by closed circuit television.

K. Final Acceptance of Liner Pipe

The final acceptance for the force main liner pipe will be based on results of the line and grade inspection. The Contractor shall find the source of any leaks identified by the inspection and make necessary repairs.

L. Safety

The Contractor shall be notified and made aware that this project involves work in live wastewater flow conditions with large diameter sewer force mains. The Contractor shall follow the appropriate safety measures for work in areas with potentially dangerous sewer gases. Confined space entry requirements and regulations shall be followed.

Work shall be completed in accordance with Section 10.06, Legal Relations and Responsibilities, Article 6.8 Safety.

Additionally, the Contractor shall submit a Safety Plan, including the name of the Contractor's Site Safety Representative, emergency telephone numbers for medical facilities, and precautions for handling and disposal of any hazardous or

flammable materials. The Safety Plan should include a code of safe practices and an emergency plan in accordance with OSHA requirements.

Article 9.6 Measurement

Measurement of the sliplining and improvements shall be Lump Sum, for all Work necessary to perform sliplining of an existing sewer gravity main crossing Dimond Blvd. with high density polyethylene (HDPE) pipe and reconnecting to the dual force mains. The Contractor shall furnish all materials, labor, and equipment for completing the work including sewer line cleaning, CCTV inspection (pre and post), liner pipe installation, casing spacers, annular space grouting, traffic control, remove and replace asphalt, new manhole (type C) with beaver slides, reconstruction of manhole #10, new piping to connect force mains, reinstallation of gate valve, pipe abandonment, and surface restoration.

Article 9.7 Payment

Payment for this Work shall be in accordance with Division 10.00 – Standard General Provisions, Section 10.07 – Measurement and Payment and shall include full payment for all Work described in this Section.

Payment will be made under the following units:

ITEM	UNIT
Slipline 48” Gravity Sewer	Lump Sum

SECTION 50.10 ANNULAR SPACE GROUTING G1

Article 10.1 Description

This section covers the various requirements of annular space grouting of sliplining rehabilitation systems. The void between the host and liner pipes (annular space) shall be grouted at designated locations to support the liner and provide long-term stability. Grouting will be completed at the locations shown on the Drawings and described in the specifications.

Article 10.2 Submittals

Submit to the Engineer at least four (4) weeks prior to commencing grouting operations, the following:

A. Pre-Construction Submittals

   a. Product literature and data pertaining to grout mix

   b. Grout mix design. An independent laboratory shall certify the results of the grout mix testing. The testing shall have been conducted within the past 18 months. The certified mix design shall include the following: a) Initial set time b) Density c) Viscosity d) 24-hour penetration resistance and 28-day compressive strengths. e) Grout working time prior to a 15 percent change in density or viscosity.

   c. Proposed method for placing grout in the annular space.

d. A detailed description of the annular space dewatering procedure and debris removal.

e. Description of keeping the liner pipe full of water during grouting operations and the 24 hours while the grout sets.

f. Maximum grouting pressure.

g. Pressure gauge certifications.

h. Bulkhead and grout injection pipe and vent design and vent pipe size.

i. Description of the method to verify that the grout has completely filled the annular space.

j. Statements of qualifications of the grout manufacturer's representative.

k. Comprehensive work plan identifying bulkhead construction, vent tube placement, access pits, methods used to prevent slipline pipe flotation and movement during grouting operations, and grout supervisor 24-hour telephone contact.

B. Quality Control Submittals

a. Manufacturer's certificate of proper installation.

b. Test reports

i. Field test reports and independent testing laboratory results for field-drawn samples.

Article 10.3 Qualification

The Contractors grouting supervisor shall have a minimum of five years of experience with the design and placement of annular space grout. The grouting supervisor shall have completed successfully at least five projects within the last three years similar to the project described in this specification. The Contractor shall submit documents demonstrating to the Engineer that his grouting supervisor is capable of meeting the requirements of these specifications. The submittal shall include contact names and phone numbers for each of the listed projects.

Article 10.4 Materials

A. Annular Space Grout

The grout shall consist of Portland Cement or Portland Cement and fly ash, water, and admixtures as required to meet these specifications. The grout shall possess good flow characteristics with minimum shrinkage and permit a flow time adequate to complete the grouting work. The grout shall have the ability to flow freely without stiffening through the annular space in the section being grouted at that time.

The Contractor shall assume that the following volumes of grout will be used for the grouting segments shown. This is the total volume for both force mains and it is intended to fill the entire annular space:

SEGMENT (PIPE STATION)	VOLUME OF GROUT (CY)
36+18 to 36+96.56	16.0

The mix shall be designed as follows:

1. Initial set time shall not be less than 2 hours.
2. The grout slurry shall have a minimum density of 55 pcf and a maximum density of 60 pcf as per ASTM C 138.
3. The grout shall have an apparent viscosity not exceeding 18 seconds in accordance with ASTM C 939.
4. The grout shall have a minimum penetrations resistance of 50 psi in 24-hours when tested in accordance with ASTM C 403 and a minimum compressive strength of 300 psi in 28-days when tested in accordance with ASTM C 495.
5. The maximum shrinkage shall not exceed one percent by volume.
6. The grout shall not bleed or segregate.

Manufacturers and products:

1. Pacific International Grout Co., Bellingham, WA; LDB 662
2. Or equivalent.

Article 10.5 Construction

The Contractor shall complete grouting in place of the sliplined segments prior to Substantial Completion. This includes bulkhead construction, annular space dewatering, and injecting annular space grout.

A. Annular Space Grout

The Contractor shall completely dewater the annular space and remove any debris or deleterious material prior to commencement of grout injection. The entire annular space shall be completely filled with grout.

Floating of the HDPE liner pipe during the grouting process is unacceptable. The Contractor shall fill the HDPE pipe completely full of water and maintain the water in the HDPE pipe for a minimum of 24 hours after the grouting operations are complete.

Bulkheads shall be constructed in manholes and/or excavation pits prior to annular space grouting. Annular space grout shall not be allowed to set in manholes.

Collapsing of the HDPE liner pipe during the grouting process is unacceptable and will be cause for rejection of the segment. The maximum grout pressure shall not exceed that as recommended by the HDPE pipe manufacturer. Grouting pressure during the entire procedure shall be monitored and carefully controlled. Venting shall be provided and installed at the upstream and downstream bulkheads to prevent the grout from attaining pressures that exceed the liner pipe manufacturers' recommendations.

The grout materials shall be mixed and pumped in equipment of sufficient size and capacity to provide the desired amount of grout for each sliplined pipe segment in a single operation unless otherwise approved by the Engineer. Pumping equipment shall be of a size sufficient to inject grout at a volume, velocity and pressure compatible with the size of the annular space. The equipment shall be capable of mixing the grout at densities required for the approved procedure and shall also be capable of changing densities as dictated by field conditions at any time during the grouting operation. Grout density shall be within two percent of the design density and shall not exceed the maximum specified density at both the injection and the vent points.

Gauges to monitor grout pressure shall be attached immediately adjacent to the injection port. The gauge shall conform to an accuracy of plus or minus 0.5 psi. The range of the gauge shall not be more than 100 percent greater than the design grout pressure. Pressure gauges shall be instrument oil filled and attached to a saddle-type diaphragm seal (gauge saver) to prevent clogging with grout. All gauges shall be certified and calibrated in accordance with ANSI B40, Grade 2A. The grout pressure recordings shall be identified, as a minimum, with the date, batch, and time of day grouting was performed and shall be submitted to the Engineer at the end of the work day that grouting was performed.

Grout placement shall not be terminated until the following conditions are met, unless otherwise approved by the Engineer:

1. The estimated annular volume of grout has been injected;
2. The exhausted grout at each vent is less than 85 percent of the density of freshly injected grout;
3. The exhausted grout viscosity at each vent is more than 115 percent of the original viscosity;
4. When recommended by the grout installer,
5. When grout is flowing out of vent pipes

B. Field Quality Control

For each batch the Contractor shall take samples and perform the following tests:

1. Density per ASTM C 138.
2. Viscosity per ASTM C 939.
3. Minimum penetration resistance in 24-hours when tested in accordance with ASTM C 403.
4. Minimum compressive strength in 28-days when tested in accordance with ASTM C 495.

An independent testing laboratory retained by the Contractor shall prepare, store, cure and test each sample. Contractor shall submit lab test results.

The Contractor is required to keep the liner pipe full of water for a full 24 hours after the grouting operations are completed.

C. Access Pits and/or Vent Tubes

The Contractor may at his option excavate additional access pits or drill vent tubes for bulkhead construction and grouting operations. The location and method of installation shall be submitted as part of the work plan identified in the Submittals Article. No additional payment will be paid for grout access pits or vent tubes.

D. Surcharging Slipline Pipe

When surcharging the HDPE slipline pipe for annular space grouting, the Contractor shall monitor the depth of flow.

Article 10.6 Measurement

No measurement will be made for work in this section.

Article 10.7 Payment

No separate payment will be made for Work in this Section.

All Work associated with Annular Space Grout G1 will be considered incidental to item 50.09 – Slipline Sanitary Sewer Gravity Crossing.

SECTION 50.11 PUMP STATION 12 IMPROVEMENTS

Article 11.1 General

The Work under this Section consists of the performance of all operations pertaining to furnishing and installing various improvements in and around Pump Station 12 in a workman like manner. The Contractor is to install improvements in accordance with these Specifications, manufacturer's recommendations, the Utility Company Design and Construction and Practice Manual and in conformity with the lines and grades as shown on the Drawings. Where the previously stated requirements are in conflict the more stringent requirement is to govern.

A. Scope

The Contractor shall provide dry well pumps, pump stands, and pump bases to replace two older style pumps and reinstall two existing pumps. Provide and install DIP piping, miscellaneous pipe fittings, check valves, air release valves and piping, adapters, pipe supports, concrete thrust blocks, and all appurtenant work necessary to connect all dry well pumps to the existing DIP sanitary sewer force mains inside Pump Station 12. Provide and install new piping, valves, solenoids, and booster pump to rehabilitate the valve control system. The Contractor shall provide and install three sluice gates, stems and brackets, and one actuator (two existing actuators will be reinstalled). Provide surface preparation and coating of the influent manhole and both wet wells. Provide and install platforms and structural members, ladders, and rungs in the influent manhole and both wet wells. The Contractor shall remove an existing wall of the pump station building and relocate another wall to accommodate equipment installation. The Contractor shall complete the Electrical Work as described in the Contract Documents.

Provide and install PVC piping, fittings, hydrant, valves, thrust blocks, adapters, earthwork, remove and replace paving, fencing and gate, and all appurtenant work necessary to extend the water service to the Pump Station building from the cul-de-

sac and provide a fire hydrant. The Contractor shall also properly abandon groundwater wells, in accordance with the requirements of the Contract Documents and as shown on the Drawings.

The Contractor shall also provide surface preparation and repainting of the existing interior and exterior surfaces of the pump station building, and exterior of generator building. The Contractor shall remove and dispose of older existing pumps, valves, piping, hydropneumatic tank, and all related appurtenances, in accordance with the requirements of the Contract Documents and as shown on the Drawings. Work covered by this specification includes providing all plant, labor, equipment, supplies, material, transportation, handling and storage, and performing all operations necessary to complete the Work specified herein.

B. Basis of Work

The Contractor shall assume full responsibility for furnishing and installing, and assuring the functional operation of a complete pump/force main system. The Contractor shall coordinate the Work to ensure pumping system interruptions are minimized and that the completed assembly meets the requirements of the Contract Documents.

C. Listed and Labeled

All equipment furnished by the Contractor covered under the National Electrical Code shall be Listed or Labeled by Underwriters Laboratory (U/L) or by an independent testing Agency acceptable to the State of Alaska Department of Labor, Mechanical Inspections Division. Other acceptable testing laboratories include Factory Mutual (FM), Edison Test Labs (ETL) and Canadian Standards Association (CSA). A Canadian Standards Association (CSA) label will require a Nationally Recognized Testing Laboratory (NRTL) sub-label.

D. Area Classification

There are areas within this project that are classified as hazardous locations in accordance with NFPA 820. Electrical systems and all equipment provided in these areas shall be approved for use in the specified environments.

Area	NEC Area Electrical Classification
Pump Station (Dry Well)	Unclassified (Mitigated by ventilation and gas detector)
Pump Station (Wet Well)	Class I, Group D, Division 1

E. Facility Operations

1. Continuous operation of Owner's facilities is of critical importance. Schedule and conduct activities to enable existing facilities to operate continuously, unless otherwise specified.

2. Include the sequencing constraints specified in Section 01 11 00 – Summary of Work of the Technical Specifications as a part of the progress schedules.

3. Perform Work continuously during critical connections and changeovers, and as required to prevent interruption of Owner's operation.

4. When necessary, plan, design, and provide various temporary services, utilities, connections, temporary piping and heating, access, and similar items to maintain continuous operations of Owner's facility.

5. Do not close lines, open or close valves, or take other action which would affect the operation of existing systems, except as specifically required by the Contract Documents and after authorization by Owner and Engineer. Such authorization will be considered within 48 hours after receipt of Contractor's written request.

6. Scheduling Owner shutdown periods shall be included in the Milestones and sequences of work specified herein as part of the progress schedule.

Article 11.2 Reference Specifications

The Standard Construction provisions of the "Municipality of Anchorage Standard Specifications, dated 2015 (MASS)", are hereby incorporated by reference, except for Standard General Provisions Articles relating to measurement, and Basis of Payment, and except as modified or specified herein. The following Specifications are also incorporated by reference:

A. AWWU 2018 Design and Construction Practices Manual

B. Applicable codes: NEC, UPC, UBC, and NFPA

C. Section III, Technical Specifications.

Article 11.3 Contractor Submittals

A. Shop Drawings

1. See Section 01 33 00 – Submittal Procedures in the Technical Specifications and Section 10.05 - Control of Work, Articles 5.5 - Shop Drawings, 5.6 - Product Data, and 5.7 - Materials.

2. Shop drawings for pumps shall also contain the following information:

a. Pump name, identification number and specification number

b. Performance curve and pump data

c. The Contractor shall require the manufacturer to indicate points on the pump characteristic (head/discharge) curves, and limits recommended for stable operation between which the pumps may be operated without surge, cavitation and vibration. The stable operating range shall be as wide as possible based on actual hydraulic and mechanical tests.

d. Pump detailed description and specification

e. Electrical data shall be submitted in accordance with the requirements of the Technical Specifications, Section III. These submittals shall include control and wiring diagrams for pumps. Motor characteristics shall also be identified to demonstrate compliance with the requirements of these specifications.

f. Assembly and installation drawings including shaft size, seal, coupling, anchor bolt plan, part nomenclature, material list, outline dimensions and shipping weights.

g. List any exceptions taken or deviations to the Contract Documents.

B. Operation and Maintenance Data

1. O&M Manuals shall be in accordance with Division 10, Article 4.20 Operating and Maintenance Manuals.

2. Contractor shall compile an individual Maintenance Summary for each applicable equipment item, respective unit or system, and for components and sub-units.

a. Contractor shall complete a Maximo Equipment Summary Form as shown in Section XVIII for each piece of equipment listed on the Maximo Equipment List shown on the Drawings. Contractor shall complete a Maintenance Summary Form for all equipment that is not included in the Maximo Equipment List shown on the Drawings but included in the Contract.

i. Maximo Equipment Summary Forms

1. Contractor shall include the Maximo Operating Location Number on the Maximo Equipment Summary.

2. Contractor shall include the Maximo Equipment Number on the Maximo Equipment Summary Form.

3. Contractor shall use the Equipment Organization and Classification Guide (EOCG) Report as a reference tool and guide for filling out the Maximo Equipment Summary forms. The EOCG Report is provided in Section XVIII.

a. Each Maintenance Summary form may take as many pages as required.

b. Forms shall be submitted on 8.5-inch by 11-inch paper.

c. Forms shall be completed using a typewriter or electronic print.

b. Describe maintenance requirements, including routine procedures, a guide to troubleshooting, disassembly, repair, re-assembly, adjusting, balancing and checking instructions. In addition, provide the following information:

i. Manufacturer’s printed operation and maintenance instruction.

ii. Sequence of operation by controls manufacturer.

iii. Original manufacturer’s parts list, illustrations, assembly drawings, and diagrams required to perform maintenance.

iv. Detailed lubrication instructions and diagrams showing points to be greased or oiled; recommended type, grade, and temperature range of lubricants and frequency of lubrication for each piece of equipment on the summary forms.

c. Recommended Spare Parts

i. Data shall be consistent with manufacturer's Bill of Materials/Parts List furnished in O&M Manuals.

ii. "Unit" is the unit of measure for ordering the part.

iii. "Quantity" is the number of units recommended.

iv. "Unit Cost" is the current purchase price.

d. Content for each Electrical or Electronic Item or System shall include a description of the Unit and Component Parts including:

i. Function, normal operation characteristics, and limiting conditions.

ii. Performance curve, engineering data, nameplate data, and test results.

iii. Complete nomenclature and commercial number of replacement parts.

iv. For panel board circuit directories, provide electrical service characteristics, controls and communications. Include as-installed color-coded wiring diagrams.

v. Describe operating procedures, including start-up, break-in, and routine operating requirements and sequences. Include regulation, control, stopping, shut-down and emergency instructions.

3. Materials and Finishes

a. Include product data, with catalog number, size, composition and color and texture designations, as well as information for re-ordering custom manufactured products.

b. Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

C. Spare Parts

1. The Contractor shall furnish two sets complete of the pump manufacturer's list of suggested spare parts of all items of each pump and motor, such as seals, packing, gaskets, nuts, bolts, washers, wear rings and bearings. Spare parts shall be labeled prior to delivery to the Owner at the job site. Each item shall be furnished with an identification tag marked with the following: the Pump Station name; the Manufacturer's part or identification number; applicable specification section number; and description of part or equipment item. Items shall be furnished complete and in coordinated packages. All spare parts are intended for use by the Owner, only after expiration of the guarantee period. Replacement parts required during the guarantee period shall be furnished and installed by the Contractor at no additional cost to the Owner.

D. Equipment Data Forms

1. In addition to the O & M Manuals, provide Equipment Data Forms in the format of the form bound in Section IV and described below. The timing of submission of these forms shall be the same as prescribed above for the O & M manuals. All applicable blanks on the forms shall be filled in completely for each equipment item. Any deficiencies found by the Owner to exist in the forms submitted shall be corrected by

the Contractor within 30 calendar days following notification by the Owner of the deficiencies.

2. The Equipment Data forms for each equipment item shall be compiled following the outline provided; manufacturer standard form will not be accepted as a substitute for the Equipment Data forms. The term “Maintenance Operation” as used in the Equipment Data forms bound at the end of the section is understood to mean any routine operation required to ensure satisfactory performance and longevity of the equipment. Examples of some typical maintenance operations are lubrication, adjustment of pump packing, routing adjustments, etc.

E. Anchoring Design

1. Refer to Section III, Technical Specifications 43 23 00 – Dry Location Liquid Pumps

Article 11.4 Products

A. Sanitary Wastewater Pumps

1. Refer to Section III, Technical Specifications 43 23 00 – Dry Location Liquid Pumps

B. Air Release Valves

1. Refer to Section III, Technical Specifications 40 05 53 – Process Valves

C. Check Valves

1. Refer to Section III, Technical Specifications 40 05 53 – Process Valves

D. Expansion Joint

1. Refer to Section III, Technical Specifications 40 23 40 – Sanitary Wastewater Process Piping

E. Platforms, Ladders, and Rungs

1. Refer to Structural specifications

F. Flange Coupling Adaptors

1. Refer to Section III, Technical Specifications 40 23 40 – Sanitary Wastewater Process Piping

G. Ductile Iron Pipe and Fittings

1. Refer to Section III, Technical Specifications 40 23 40 – Sanitary Wastewater Process Piping

H. Sluice Gates and Actuators

1. Refer to Section III, Technical Specifications 40 05 60 – Sluice Gates, and 40 05 65 – Sluice Gate Actuators

I. Pipe Supports and Hangers

1. Refer to Section III, Technical Specifications 40 05 07 – Hangers and Supports for Process Piping

J. Valve Operator Floor Stand and Extensions

1. Refer to Section III, Technical Specifications 40 05 53 – Process Valves

K. Painting and Coating

1. Refer to Section III, Technical Specifications 09 90 00 – Painting and Coating

L. Linked Rubber Seals for Pipe Penetrations

1. Refer to Section III, Technical Specifications 40 23 40 – Sanitary Wastewater Process Piping

M. Electrical Work

1. Refer to Section III, Technical Specifications 26 05 00 – Electrical Work, General

N. Sewer Bypass

1. Refer to Section 50.05 – Sanitary Sewer Flow Bypass

O. Groundwater Well Abandonment

1. Refer to Section 60.08 – Decommission Water System and Components

P. Fencing and Gates

1. Refer to Section 70.08 – Reset Fence and Section 70.18 – Chain Link Fence

Q. Electrical Work

1. Refer to Section III, Technical Specifications 26 05 00 – Electrical Work, General

R. Water Service PVC Piping, Valves, and Hydrant

1. Refer to Division 60 – Water Systems

Article 11.5 Construction

A. Piping and Supports

1. The pumps, piping, valves, and controls shall be installed in accordance with the manufacturer's instructions and recommendations at the locations shown. Installation shall include furnishing the required oil and grease for initial operation in accordance with the manufacturer's recommendations. Anchor bolts shall be set only after the discharge piping has been properly installed, to ensure exact fit with embedded piping components.

2. Piping and appurtenances shall be installed consistent with methods and requirements of the Contract Documents as a whole.

3. Piping to be installed in accordance with accepted industry standards. Complete installation to present a neat and orderly appearance. Coordinate wall penetrations to ensure placement of piping can be accomplished as shown and specified.

4. Support piping as shown on the Plans and in accordance with Section III, Technical Specifications 40 05 07 – Hangers and Supports for Process Piping. Allow adequate clearance for placement of flange nuts and bolts.

5. Flange bolts shall be tightened so the gasket is uniformly compressed and sealed. Both threads and nut-bearing surfaces shall be lubricated before tightening. Do not distort flanges.

6. Holes for embedded bolts shall be installed with care so that multiple or oversized holes are not drilled. In the event that holes are not drilled properly in accordance with the manufacture's recommendation, repairs shall be made with non-shrink grout in a manner that the full integrity of the structure is achieved as intended.

B. Earthwork

1. In addition to the other requirements of Division 20, Standard Construction Specifications for Earthwork, as amended and supplemented in these Special Provisions, comply with following requirements:

a. Excavation and Backfill

i. Structure, Roadway, and Embankment Excavation

1. Except when specifically provided to the contrary, excavation shall be performed as necessary for the construction of interconnecting piping, associated utilities, and associated site work. Excavation shall include the removal of all materials of whatever nature encountered, including all obstructions of any nature that would interfere with the proper execution and completion of the Work. The removal of said materials shall conform to the lines and grades shown or ordered. Unless otherwise specified or shown, the entire area requiring excavation, fill, or backfill shall be stripped of all vegetation and debris, and such material shall be removed from the site and disposed of prior to performing any excavation or placing any fill.

ii. Operation of Equipment Near Structures

1. The method of excavation used is the responsibility of the Contractor. Excavation that cannot be accomplished without endangering the present or new structures shall be done with hand tools. The Contractor shall exercise extreme care to protect the exterior coating of structures.

iii. Pipeline and Utility Trench Excavation

1. Unless otherwise shown or ordered, excavation for pipelines and utilities shall be open-cut trenches. Trench widths shall be kept as narrow as is practical for the method of pipe zone densification selected by the Contractor, but shall have a minimum width at the bottom of the trench equal to the outside diameter of the single pipe plus 24 inches or the sum of outside diameters of double pipes plus 36 inches. The maximum width at the top of the pipes shall also be equal to the outside diameter of the pipe plus 30 inches for single pipe, and the sum of the two pipes width plus 54 inches for two pipes. Electrical conduit shall be installed in trench excavation with a minimum width of 24 inches, and a maximum width of 30 inches. All conduit excavation shall be done in straight lines as approved by the Engineer.

iv. Trench Bottom

1. Where bedding is required, the bottom of the trench shall be excavated uniformly to grade 6 inches below bottom of the pipe, except as noted below. Where bedding is not required, the trench bottom shall be graded such that the pipe when first laid will be continually in contact with the ground along the extreme bottom of the pipe. Rounding out the trench to form a cradle for the pipe will not be required. Electrical conduit shall be bedded using a minimum of 6 inches of Class B bedding material.

v. Excavation in the Vicinity of Trees

1. Except where trees are shown or specified to be removed, trees shall be protected from injury during construction operations. No tree roots over 2 inches in diameter shall be cut without express permission of the Engineer. Trees shall be supported during excavation by any means previously reviewed by the Engineer.

vi. Backfill Around Structures

1. Backfill shall not be dropped directly upon any structure or pipe. Backfill shall not be placed around nor upon any structure until the concrete has attained sufficient strength to withstand the loads imposed. Backfill around water retaining structures shall not be placed until the structures have been tested.

vii. Backfill in Wet Excavations

1. Backfill shall only be placed after all water is removed from the excavation.

viii. Weather Limitations

1. Unless otherwise authorized by the Engineer, fill or backfill material (including trench zone and pipe zone material, foundation material), shall not be placed on frozen ground nor when the atmospheric temperature is below 35°F. Any completed work that is damaged by weather prior to final inspection shall be reconditioned, reshaped, and recompacted by the Contractor in conformance with the requirements of these Specifications, at no additional cost to the owner. Backfill materials that are frozen are not allowed, and any such material utilized that in the opinion of the Engineer is unsuitable for backfill shall be removed or replaced at no additional cost to the Owner.

b. Mechanical Compaction

i. Equipment weighing more than 10,000 lbs. may not be used closer to walls than a horizontal distance equal to the depth of the fill at that time. Hand operated power compaction equipment shall be used where use of heavier equipment is impractical or restricted due to weight limitations.

ii. Compaction equipment shall be of suitable type and adequate to obtain the densities specified. It shall be the Contractor’s responsibility to demonstrate that the equipment proposed for use is capable of producing satisfactory results.

Backfill shall be compacted to a minimum of ninety-five percent (95%) of maximum density, unless otherwise noted.

iii. Compaction shall be operated in strict accordance with the manufacturer's instructions and recommendations. Equipment shall be maintained in such condition that it will deliver the manufacturer's rated compactive effort. If inadequate densities are obtained, larger and/or different types of additional equipment shall be provided by the Contractor. Hand-operated equipment shall be capable of achieving the specified densities.

c. Shoring, Sheeting and Bracing/Shoring and Sheeting Left in the Trench and Portable

i. The Contractor shall design, furnish, place, and maintain all supports and shoring that may be required for the sides of the excavations, and all pumping, ditching, or other measures for the removal or exclusion of water, including taking care of storm water, ground water, and waste water reaching the site of the Work from any source so as to prevent damage to the Work or adjoining property. Excavations shall be sloped or otherwise supported in a safe manner in accordance with applicable State and Federal safety requirements and the requirements of any current or applicable OSHA Safety and Health Standards for Construction. All shop drawings and design data shall be submitted to the Engineer for review. See Section 20.30 - Shoring, Sheeting and Bracing/Shoring and Sheeting Left in the Trench and Portable.

C. Structural

1. Refer to Section III, Technical Specifications

D. Pump and Piping Installation

1. The pumping equipment shall be installed in strict accordance with the manufacturer's recommendations, technical specifications, and in accordance with the details shown on the Drawings. A representative of the pump manufacturer shall inspect the finished installed equipment and instruct the Owner's operator in the operation of the station.

2. The Contractor shall coordinate Pump Station components, and floor grouting geometry and dimensions, as shown on the Drawings, with the pump manufacturer's recommendations to ensure proper functioning of pumping equipment and proper fit of the pump, motor, controls, piping, base supports, and any other related components.

3. The Contractor shall provide any miscellaneous supports, attachments, and appurtenances, whether or not shown on the Drawings, to provide a complete and functional Pump Station system. Refer to Section III, Technical Specifications 40 05 07 – Hangers and Supports for Process Piping

E. Valve Installation

1. General

a. All valves and accessories shall be installed in accordance with the manufacturer's written instructions, and as shown and specified. Valves shall be

firmly supported to avoid undue stresses on the pipe, and the Contractor shall provide any supports necessary to achieve such adequate support, regardless of whether such supports are shown on the Drawings. Refer to Section III, Technical Specifications 40 05 53 - Process Valves.

2. Access

a. All valves shall be installed to provide easy access for operation, removal, and maintenance and to avoid conflicts between valve operators and structural members or handrails or other mechanical or electrical equipment.

3. Coating

a. Refer to Section III, Technical Specifications 09 90 00 - Painting and Coating

F. Testing

1. Valve Testing

a. Unless otherwise specified, each valve body shall be tested under a test pressure equal to twice its design water-working pressure.

2. Equipment Testing and System Startup

a. General

i. Equipment testing and startup of the Pump Station, to be constructed in accordance with the Technical Specifications and Contract Documents, are requisite to satisfactory completion of the Contract and, therefore, shall be completed within the contract time.

b. The Contractor shall provide the services of an experienced and authorized representative of the Supplier of each item of equipment indicated in the equipment schedules or shown on the Drawings, who shall visit the site of the Work and inspect, check, adjust if necessary, and approve the equipment installation. The Contractor shall arrange to have the Supplier's representative revisit the job site as often as necessary until any and all trouble is corrected, and the equipment installation and operation are satisfactory to the Engineer.

c. The Contractor shall require that each Manufacturer's representative furnish to the Engineer a written report addressed to the Owner certifying that the equipment has been properly installed and lubricated, is in accurate alignment, is free from any undue stress imposed by connecting piping or anchor bolts, and has been operated satisfactorily under full-load conditions.

d. The Contractor shall be responsible for scheduling all operations testing. The Contractor is advised that the Engineer and Owner's operating personnel will witness operations testing and that the Supplier's representative shall be required to instruct the Owner's operating personnel in correct operation and maintenance procedures. Such instruction shall be scheduled at a time arranged with the Owner at least two weeks in advance and shall be provided while the respective representative's equipment is fully operational. On-site instruction shall be given by qualified persons who have been made familiar in advance with the equipment

and systems required under the Contract Documents. The Contractor shall have previously furnished the technical manuals required for submittal.

e. The Contractor shall notify the Engineer at least three days in advance of each equipment test.

f. The Contractor shall furnish all personnel, power, water, chemicals, fuel, oil, grease, and all other necessary equipment, facilities, and services required for conducting the tests.

g. Prior to startup, the Contractor shall schedule a pre-commissioning walkthrough with the Owner. Any deficiencies noted during the walkthrough shall be corrected prior to system startup.

h. It is not the intent of the Engineer to instruct the Contractor in the startup of the system; however, the Engineer will be available prior to and during startup to provide technical support to the Contractor.

i. Not less than 1 month prior to startup, the Contractor shall submit to the Engineer for review, a detailed schedule of operations which will be necessary to effect a successful initial operation and sustained period of operation for the duration of the required startup period.

Article 11.6 Measurement

Measurement of the Pump Station improvements shall be Lump Sum, for all Work necessary to upgrade the sanitary sewer pump station including excavation and equipment removal, pump replacement, piping, valves, coating, sluice gates and actuator, platforms and ladders, drywell, fence, topsoil and seeding, water service piping, and electrical components and controls.

Article 11.7 Payment

Payment for this Work shall be in accordance with Division 10.00 – Standard General Provisions, Section 10.07 – Measurement and Payment and shall include full payment for all Work described in this Section.

Payment will be made under the following units:

ITEM	UNIT
Construct Pump Station 12 Improvements	Lump Sum

SECTION 50.12 CAMPBELL CREEK UNDERCROSSING

Article 12.1 General

NIC

The Work under this Section consists of the performance of all operations pertaining to furnishing and installing dual 24" force mains under Campbell Creek, adjacent to the existing force main culvert crossing. This project is located in the Anchorage Coastal Wildlife Refuge. The work will have to be completed during winter conditions to protect the area vegetation to the greatest extent possible, avoid disturbing the creek during salmon runs, and avoid loud noises and disturbances during the waterfowl nesting period. The existing force mains will have to remain in service until the undercrossing is complete

and a sequential tie into the exiting force mains can be accomplished. After the undercrossing is in service, the force mains and the Culverts at the existing crossing will be demolished and the stream will be restored to a natural state.

The Work under this Section consists of performing all Work required for furnishing and installing improvements at and around the stream crossing in a workman like manner meeting acceptable standards. The Contractor is to install improvements in accordance with these Specifications, agency permit requirements, manufacturer's recommendations, and in conformity with the lines and grades as shown on the Drawings. Force main materials and construction shall adhere to the requirements of Division 60 – Water Systems, Section 60.02 – Furnish and Install Pipe.

A. Scope

The Contractor shall provide and install a creek bypass flume, a silt fence and sediment control facilities. The existing rip rap shall be removed and stockpiled for reuse. An open trench across the creek shall be excavated and 24" HDPE force mains installed in the trench under the creek. Shoring will be installed on the west side of the creek and a 10-foot diameter manhole will be installed with sealed cleanout fittings. The connections to the existing force mains will be made using 24-inch ductile iron pipe with appropriate fittings. The connections will have to be made in an appropriate sequence so at least one of the two force mains can remain in service at all times. Following the change over to the undercrossing, the existing force main crossing and the dual arch pipe CMP culverts will be removed, and the stream restored to a natural state. The useable rip rap material will be used to armor the trench excavation, and the access drive slopes at the siphon access (Schedule "C" of this contract)., and at the stream bank location shown on the plans. Usable gravel shall be used for access drive construction (Schedule "C") and waste material will be disposed at an approved location.

NIC

B. Work Plan

Context – The project entails routing dual 24-inch sewer pressure pipelines under Campbell Creek near the existing culvert crossing. The culvert crossing will subsequently be removed. The project is located in the Anchorage Coastal Wildlife Refuge and construction will require at least three agency permits. Permit requirements will be part of the work. Work will be completed in winter conditions to minimize disturbance of the fish and wildlife, the surrounding vegetation, and minimize impacts on the creek.

Construction Means and Methods – The final work plan will be proposed by the successful contractor and approved by the engineer and agencies. The approved construction plan will be executed by the successful contractor during the approved time period.

EXAMPLE WORK PLAN:

a. Prepare submittals for work plan, parts and materials, and obtain approvals.

b. Obtain and assemble parts and materials at work site.

c. Excavate and pour mid-span thrust anchors adjacent to each of the four cut-in locations on the existing force mains.

d. Pour concrete pipe weights.

e. Fuse 24” HDPE pipe lengths with blind flanges at each end. Pressure test fused pipeline sections.

f. Align fused HDPE force mains with proposed undercrossing trench.

g. Remove Rip Rap material from slopes and stream bottom, upstream and downstream of culverts. Stockpile for future restoration work.

h. Install 60” diam X 50 ft long steel pipe flume.

i. Install Geotextile silt fence across creek upstream side of flume discharge.

j. Excavate trench across the creek

   i. Reference tide data and select period of minimal tide fluctuation. Plan to complete trench excavation and backfill during this period.

   ii. Begin excavation at the center of the creek and proceed both directions.

   iii. Stockpile dry silty material for later backfill. Haul wet silty material to waste.

   iv. Slope sidewalls as necessary to stand during construction period.

k. Place Filter Material Type D as foundation in bottom of trench. Verify grade.

l. Pull/skid one force main at a time into trench with water at creek level. Fill the pipe with water and float the pipe across the creek and under the flume. It will be necessary to push the pipes down to pass under the flume.

m. Maneuver each of the pipes into position and carefully place the concrete weights to anchor the pipes to the bottom. Tie a float to an eyelet on each of the weights to provide a visual reference for the pipe alignment.

n. Verify pipe grade and alignment and adjust as necessary.

o. Install shoring as necessary for installation of manhole #77B

p. Bed and backfill pipe assembly with filter material, work the filter material around the pipes as shown in the drawings and compact using the excavator bucket. Fill to one foot above the normal water level with Type IIA and compact using the excavator bucket. Place geotextile over the Type IIA gravel and place salvaged Rip Rap to the stream bottom level or original contours. Backfill remaining trench from Station 1+70 east with dry silt material.

q. Dewater west end of trench, west of the shoring bulkhead, exposing the blind flanges.

r. Place manhole foundation material, and check grades.

s. Lift in and set manhole assembly

NIC

t. Connect DIP pipe to HDPE flanges.

u. Complete pipe installation to west connection point (0+00).

v. Complete field applied coatings and corrosion protection

w. Bed pipe with Type IIA material and compact.

x. Pressure test entire undercrossing segment, DIP and HDPE.

y. Backfill trench with dry silt material

z. Using operation sequences, connect the north undercrossing while the south force main remains in service. Then switch over to the new north undercrossing and connect the south under crossing.

aa. Demo culverts.

bb. Place rip rap slope protection and complete restoration.

cc. Restore stream cross-section as shown in the Plans and restore the construction area and damaged vegetation as necessary.

NIC

C. Basis of Work

The Contractor shall assume full responsibility for furnishing, installing, and assuring the functional operation of a complete force main system. The Contractor shall coordinate the Work to ensure pumping system interruptions are minimized and that the completed assembly meets the requirements of the Contract Documents.

D. Facility Operations

a. Continuous operation of Owner's facilities is of critical importance. Schedule and conduct activities to enable existing facilities to operate continuously, unless otherwise specified.

b. Include the sequencing constraints specified in Section 01 11 00 – Summary of Work of the Technical Specifications as a part of the progress schedules.

c. Perform Work continuously during critical connections and changeovers, and as required to prevent interruption of Owner's operation.

d. When necessary, plan, design, and provide various temporary services, utilities, connections, temporary piping and heating, access, and similar items to maintain continuous operations of Owner's facility.

e. Do not close lines, open or close valves, or take other action which would affect the operation of existing systems, except as specifically required by the Contract Documents and after authorization by Owner and Engineer. Such authorization will be considered within 48 hours after receipt of Contractor's written request.

f. Scheduling Owner shutdown periods shall be included in the Milestones and sequences of work specified herein as part of the progress schedule.

Article 12.2 Reference Specifications

The Standard Construction provisions of the "Municipality of Anchorage Standard Specifications, dated 2015 (MASS)", are hereby incorporated by reference, except for Standard General Provisions Articles relating to measurement, and Basis of Payment, and except as modified or specified herein. The following Specifications are also incorporated by reference:

A. Section III, Technical Specifications.

   a. 01 11 00 – Work Summary

   b. 01 33 00 - Submittal Procedures

   c. 01 75 00 - Starting and Adjusting

Article 12.3 Contractor Submittals

A. Shop Drawings and submittals

   a. See Section 01 33 00 – Submittal Procedures in the Technical Specifications and Section 10.05 - Control of Work, Articles 5.5 - Shop Drawings, 5.6 - Product Data, and 5.7 – Materials.

NIC

B. Undercrossing Submittals

   a. Work Plan

   b. Pipe and fittings

   c. Manhole and A-lok seals

   d. Shoring

   e. Concrete Anchors

   f. Cathodic Protection

Article 12.4 Construction

A. Earthwork

   a. An objective of this project is to minimize the number of loads of borrow and waste material that have to transit the one lane drive between the project site and 100th Avenue.

   b. The embankment material that meets the requirements of MASS Type 3 classified fill can be used in place of the Type IIA classified fill for constructing the access drive in Schedule "C" of this contract.

   c. All costs for excavating, placing, and/or disposing of import, usable, or waste material shall be included in the lump sum bid amount.

B. Piping and Supports

   a. The valves, piping and controls shall be installed in accordance with the manufacturer's instructions and recommendations at the locations shown.

b. Piping and appurtenances shall be installed consistent with methods and requirements of the Contract Documents as a whole.

c. Force main pipe materials and construction will adhere to the requirements of MASS Section 60.02 – Furnish and Install Pipe.

d. Piping to be installed in accordance with accepted industry standards. Complete installation to present a neat and orderly appearance. Coordinate manhole penetrations to ensure placement of piping can be accomplished as shown and specified.

e. Support piping as shown on the Plans and in accordance with Section III, Technical Specifications 40 05 07 – Hangers and Supports for Process Piping. Allow adequate clearance for placement of flange nuts and bolts.

f. Flange bolts shall be tightened so the gasket is uniformly compressed and sealed. Both threads and nut-bearing surfaces shall be lubricated before tightening. Do not distort flanges.

C. Valve Installation

NIC

a. General

All valves and accessories shall be installed in accordance with the manufacturer's written instructions and as shown and specified. Valves shall be firmly supported to avoid undue stresses on the pipe, and the Contractor shall provide any supports necessary to achieve such adequate support, regardless of whether such supports are shown on the Drawings. Refer to Section III, Technical Specifications 40 05 53 - Process Valves.

b. Access

All valves shall be installed to provide easy access for operation, removal, and maintenance and to avoid conflicts between valve operators and structural members or handrails or other mechanical or electrical equipment.

D. Testing

a. Valve Testing

Unless otherwise specified, each valve body shall be tested under a test pressure equal to twice its design water-working pressure.

b. Pipe Testing

i. Perform hydrostatic testing in accordance with MASS Section 60.02. Test pressure 150 psi.

ii. Test HDPE after fusing but prior to installing in the trench.

iii. Test entire undercrossing assembly prior to connecting into the existing system.

E. Sewer Closed Circuit Television Inspection (CCTV)

Contractor shall perform CCTV inspection of the entire undercrossing assembly prior to connecting to the existing system. The assembly shall be inspected in accordance with MASS Section 50.07, for "Acceptance of new pipe". If there is debris present in the pipe, "Sewer line cleaning for CCTV" shall be completed.

Article 12.5 Measurement

NIC

Measurement of the Undercrossing Improvements shall be Lump Sum, for all Work necessary to bypass the stream flow, provide all materials and install the pipe undercrossing and manhole. Perform testing, demolish abandoned sewer force mains and CMP multiplate culverts, process usable material, and dispose of waste material. Restore stream and surrounding grounds.

Article 12.6 Payment

Payment for this Work shall be in accordance with Division 10.00 – Standard General Provisions, Section 10.07 – Measurement and Payment and shall include full payment for all Work described in this Section.

Payment will be made under the following units:

ITEM	UNIT
Campbell Creek Force Main Undercrossing	Lump Sum

SECTION 50.13 ACCESS DRIVES

Article 13.1 General

The Work under this Section consists of furnishing all plant, labor, equipment, supplies, and material in performance of all operations pertaining to the construction of Schedule C – Access Drives. Work includes the excavation and disposal of unsuitable and/or surplus material, excavation and placement of usable excavation, placement of Type IIA classified material, placement of leveling coarse, grading, ~~placement of rip-rap~~, Type B geotextile, culvert installation, remove and replace fencing, gate installation, and topsoil and seed.

Contractor shall not be entitled to additional compensation for performing excavation not previously authorized by the Engineer.

Article 13.2 Survey Stakes

The Contractor shall place control stakes on each side of, and beyond the limits of, the proposed excavation. Stakes will be set at grade breaks and on even grades at intervals not to exceed fifty feet (50'), with additional stakes on vertical curves. These shall be marked with the station, offset, and show the cut or fill to centerline or grid design grade.

Article 13.3 Miscellaneous

Public property lying within the right-of-way, such as signs and markers, that interferes with construction shall be removed and reset at the time and place as directed by the Engineer. Any damage by the Contractor shall be repaired or the item replaced in kind at the Contractor's expense.

Contractor shall remove culverts designated for salvage. Contractor shall deliver salvaged culverts to the location specified in the Contract Documents or as directed by the Engineer.

A disposal site for non-salvageable materials shall be provided by the Contractor per Division 10, Section 10.04, Article 4.9 – Disposal Sites

All existing valve boxes, cleanouts, manholes, etc. shall be located and exposed by the Contractor and carefully protected during the course of the Work. The Contractor, in conjunction with the Engineer, shall check all utilities prior to the start of the construction and record their condition. All manholes, catch basins, cleanouts, etc. will be checked for damage resulting from the Contractor's operation prior to final acceptance by the Owner. The Contractor is responsible for restoring all existing utilities to pre-existing conditions, and shall coordinate with the affected utility in having any necessary repairs completed.

All existing utilities requiring adjustment to grade shall be adjusted by the Contractor in accordance with the applicable Standard Details.

Article 13.4 Unusable and Usable Excavation

Unusable excavation shall consist of all excavation which is excess or not suitable for classified fill or backfill as determined by the Engineer. Unusable excavation shall include the surface mat.

Usable excavation shall consist of material from excavation that is designated by the Engineer as suitable for fill or backfill.

If usable soil conditions are encountered at elevations different from those indicated on the Drawings, the Engineer may direct, in writing, that the excavation be altered to elevations either above or below those specified.

Any unauthorized excavation beyond the specified lines, grades, and cross sections shall be filled with classified fill or backfill and compacted without additional cost to the Owner. The Contractor shall control the banks of all excavated areas as necessary to prevent movement of soil.

The Contractor shall be responsible for keeping all embankments and excavation well shaped and drained. The subgrade shall be maintained, compacted in cut sections if required, and kept free of leaves, sticks, or other debris.

The Contractor shall perform whatever work necessary to prevent flow and accumulation of surface water or ground water in excavations. Work associated with pumping or dewatering shall be considered incidental to the Contract and no separate payment shall be made.

Article 13.5 Utilization or Disposal of Excavated Material

Excavated material conforming to the specifications for classified fill and backfill shall be used where practical for fill and backfill as directed by the Engineer. When this material is used, it shall be considered usable excavation. Usable excavation shall be compacted in accordance with Section 20.01, Article 1.5 - Compaction Standards. When not used on the Project site, the material shall be hauled away and treated as unusable excavation.

Unusable excavation shall be hauled to a Contractor-furnished disposal site as delineated in Division 10, Section 10.4, Article 4.9 – Disposal Sites.

Article 13.6 Excavation

The Contractor shall utilize whatever methods and equipment necessary to excavate to the limits designated by the Drawings and authorized by the Engineer, except that no equipment or method may be utilized that because of its action deteriorates the subgrade making additional excavation necessary beyond the limits originally authorized.

Article 13.7 Measurement

Measurement of the Schedule C – Access Roads shall be Lump Sum, for all Work necessary to provide all materials and install the Schedule C improvements per the Drawings.

Article 13.8 Payment

Payment for this Work shall be in accordance with Division 10.00 – Standard General Provisions, Section 10.07 – Measurement and Payment and shall include full payment for all Work described in this Section.

Payment will be made under the following units:

ITEM	UNIT
Construct Access Drives	Lump Sum

SECTION 50.14 CURED IN PLACE PIPE (CIPP) LINING AND SPOT REPAIR

Article 14.1 General

Where indicated on the Drawings perform lining of force mains with a cured in place pipe complete in place. The Contractor shall furnish all labor, materials, and equipment for completing the Work including pipe cleaning and pipe lining installation including pipe patches.

The CIPP shall meet the requirements of ASTM F1REPAIR216, ASTM F1743, and NSF/ANSI 61 The CIPP shall extend the full length of the sections of the host pipe being rehabilitated and shall provide a structurally sound, impermeable, jointless, close-fitting pipe that when cured is mechanically fixed inside the host pipe.

Article 14.2 Definitions

1. **Product Pipe**: The new permanent pipeline for operational use.
2. **Host Pipe**: The existing pipe or main that is being rehabilitated or upgraded.
3. **CIPP**: Cured in place pipe.
4. **CCTV**: Closed circuit television inspection.
5. **Access Pits**: The pits that are excavated from the ground surface to the water pipe to provide access for installing the new CIPP liner into the host pipe.
6. **Pipe Segment**: The section of the CIPP work and product pipe that is located between the access pits.

7. **Force Main Tie-In**: A location where pipe and fittings are used to make a connection between an existing force main(s) and CIPP lined force main(s).

8. **Force Main Termination**: A location where pipe and fittings are used to make a force main dead-end termination.

Article 14.3 Submittals

A. General Submittals

Submit the following for review and approval by the Engineer:

1. Product information for the lining system materials, methods of repair and MSDS for all materials used.
2. Calculations showing that the lining thickness and strength has been designed to meet the requirements of this specification.
3. Material sample test results including soil cell testing, chemical resistance, SDR, creep and long-term structural loading tests.
4. Satisfactory sample test results from three previous projects where the lining system has been used.
5. Sampling and testing plan for the CIPP.
6. Installers proof of manufacturer's certification.
7. Information confirming that the pipe conforms to the requirements of the Materials Section of this Specification.
8. Submit documented evidence of the ability and capacity of the CIPP installer to perform this work. Submit the name and qualifications of the senior installation supervisor who will be on the project whenever lining materials are being handled, impregnated with resin, or installed. The senior installation supervisor shall have installed a minimum of 3,000 feet of similar CIPP liner of the same CIPP system.
9. Sampling and testing plan that shall include the Contractors proposed procedures for quality control, product sampling and testing.
10. Quality Control Plan (QCP) as described in this specification.
11. Record drawings.

B. Quality Control Plan (QCP)

Submit a detailed quality control plan (QCP) that includes the following:

1. A description of the quality controls to be performed by the Contractor.
2. Defined responsibilities of the Contractors personnel who are responsible for quality control.

3. Procedures and methods that will be followed for quality control, product sampling and testing including method and frequency of product sampling and testing both in the raw materials form and cured product form.
4. Inspection forms and guidelines for quality control inspections prepared in accordance with the standards specified in these Contract Documents.

C. Work Plan

1. See Section 50.09 for example construction schedule

Article 14.4 Materials

A. Tube

The tube shall consist of one or more layers of felt or woven resin-impregnated material and a watertight interior coating.

B. Resin/Catalyst

Thermosetting epoxy resin compatible with the approved liner and a compatible catalyst system as specified by the resin manufacturer.

C. Structural Requirements

Design Criteria: The cured-in-place-pipe thickness shall be calculated and designed using manufacturer's standards and ASTM F1216 and based upon the following conditions.

1. All host pipes shall be considered fully deteriorated pressure pipe.
2. All pipes shall be subject to a water table of not less than 6 feet above the invert of the pipe.
3. All pipes shall have a minimum of 2% ovality reduction factor in the circumference.
4. A factor of safety of not less than 2.0 shall be applied.
5. The enhancement factor K shall not be higher than 7.
6. Live load shall be AASHTO HS-20.
7. Internal pressure shall be 150 psi.
8. Soil density shall be 125 pcf.
9. Modulus of soil reaction E' shall be 3,000 psi.

D. Mechanical Properties

The CIPP when cured shall have the following minimum initial properties when tested in accordance with ASTM F1216:

Flexural Strength (tested in accordance with ASTM D790) 4,500 psi

Flexural Modulus (tested in accordance with ASTM D790) 250,000 psi

Tensile Strength (tested in accordance with ASTM D638) 3,000 psi

E. Other Properties

The completed liner system shall have the following minimum properties:

1. Capable of withstanding an internal pressure of no less than 150 psi.
2. Have a friction coefficient Hazen-Williams factor greater than 120.
3. Meet the requirements of AWWA M28 structural Class IV: Fully-Structural, capable of withstanding external loads and internal design pressure for a minimum of 50 years.

F. Sealing Materials

Raven Lining Systems Aquatapoxy A-61(or equivalent) used to seal the liner at exposed ends or where exposed at other locations or used to repair the liner where damaged shall be materials that are approved by the liner manufacturer and engineer.

G. Internal Point Repair

Internal flexible membrane circular pipe repair tube that is installed by insertion into a host pipe. The internal point repair shall meet the requirements of ASTM F-1216. Provide Source One Environmental PipePatch or equal.

H. CIPP Spot Repairs

CIPP spot repairs shall be completed using appropriate equipment, including high pressure water jet, sewer cleaning equipment, CCTV, and low temperature U.V. packer. Use a non-shrink impregnated prepreg liner.

Article 14.5 Construction

A. Safety

The Contractor shall carry out this operation in strict accordance with all OSHA and manufacturer's safety requirements and shall meet the requirements of MASS Section 10.06, Article 6.8 Safety. Particular attention is drawn to those safety requirements involving working with scaffolding entering confined spaces and operations with hot media.

B. Flow Control

Flow from the existing force main system shall be controlled as required to complete the lining work. Flow in the host pipe shall be controlled by isolating the portion of the force main to be rehabilitated from those portions of the existing force main system that are to remain in service.

C. Force Main Rehabilitation Access Pits and Host Pipe Access

Locate and construct access pits required to install the liner and rehabilitate the force main. Location of the access pits shall be based on the information represented on the Drawings, the conditions of the project site, and any design and/or manufacturing limits of the CIPP liner. Excavate and backfill the access pits in accordance with Section 20.13 Trench Excavation and Backfill.

Carefully expose and remove the minimum length of host pipe and fittings necessary to accomplish liner insertion. The existing host pipe shall be cut square with no split or fractured ends. All cut faces of the host pipe shall be chamfered on the inside surface to prevent damage to the liner during or after insertion. Immediately upon opening the host pipe, the ends of the adjacent existing force main that are not to be lined shall be capped or plugged to prevent debris from entering during the rehabilitation work.

Installation of a liner will not be allowed through the following host pipe fittings unless approved otherwise on a case-by-case basis or shown as acceptable on the drawings:

1. Tees
2. Valves
3. Host pipe nominal diameter changes and reducers
4. Bends that exceed 45 degrees or exceed the manufactures' recommendations, if applicable

The Contractor shall construct access pits at these locations and remove the fittings from the host pipe and create a lining insertion/exit pit or install a section of host pipe to allow the lining process to cross through the pit. An alternate method for lining across openings in the host pipe that would require Engineer preapproval on a case by case basis is installation of a plug, CIPP point repair or grout plug.

D. Pre-Installation Host Pipe Preparation

Cleaning, preparation and inspection of host pipe shall be performed by experienced personnel trained in locating breaks, obstacles, and service connections by closed-circuit television.

The host pipe shall be cleaned to remove all rust, scales, tuberculation, deposits, loose or deteriorated remains of any original coatings and other foreign materials from inside the of the host pipe so as to produce a smooth surface finish that will allow the new liner to adhere and bond to the host pipe.

Flush the host pipe with clean water to remove any loose debris from the interior surface of the pipe. Remove all standing water from the inside surfaces of the cleaned host pipe by passing a sufficient number of oversized swabs or pigs through the host pipe or use a progressive expansion method to remove standing water. Use mechanical fans or other means to dry the interior surface of the host pipe.

The interior of the host pipe shall be carefully inspected to determine the location of any conditions which may prevent proper installation of the lining of the pipelines, and it shall be noted and brought to the attention of the Engineer, so that these conditions can be corrected. Immediately after the inspection is complete, the Contractor shall provide the Engineer with an inspection recording and suitable log for later reference. Pipe inspection Work shall be accomplished in accordance with Section 50.07 SEWER CLOSED CIRCUIT TELEVISION INSPECTIONS.

The Contractor shall inspect the force main pipe immediately before the insertion of the impregnated tube to assure that the pipe is clean and dry and existing pipe conditions are acceptable for lining. The Engineer shall be on-site during the Contractor's inspection and confirm the condition of the pipe.

E. Line Obstructions

If the pre-insertion or pre-rehabilitation video inspection reveals an obstruction in the existing pipe (ground water leaks, heavy solids, dropped joint, collapsed pipe, etc.) that cannot be removed with conventional cleaning equipment, then the obstruction shall be repaired or removed by the Contractor in conformance with the relevant Sections of these Specifications. Work to remove an obstruction that cannot be removed with conventional cleaning equipment shall be paid for separately in accordance with Section 50.02 Furnish and Install Pipe.

F. Internal Point Repair

During preparation of the host pipe for lining, install an internal point repair at the locations shown on the drawing and/or discovered during D. Pre-Installation Host Pipe Preparation of this Article 14.5. Install in accordance with manufacturers recommendations.

G. Resin Impregnation

The Contractor shall designate a location where the tube will be impregnated with resin, using distribution rollers and vacuum, to thoroughly saturate the tube prior to its dispatch for installation. A catalyst system or additive(s) compatible with the resin and tube may be used per the manufacturer's recommendation. They shall, however, not impair or reduce the resin's ability to meet the load bearing criteria. The quantity of resin used for tube impregnation shall be sufficient to fill the volume of air voids in the tube with additional allowances for shrinkage and the loss of resin through cracks and irregularities in the original pipe wall.

H. Liner Installation

The CIPP shall be installed in accordance with ASTM F 1216 or ASTM 1743. Care shall be taken not to overstress the tube at elevated curing temperatures or pressures, which may cause damage or failure prior to cure.

Liner insertion shall not exceed the manufacturer's recommendations for maximum tension. Provide information on the maximum allowable liner tension and the maximum winch pulling force. If the liner is installed by the pull-in method and the pulling winch has the capacity to exceed the maximum liner tension, then a gauge shall be installed on the pulling equipment to measure the pulling force. The gauge shall be capable of continuously measuring the force being applied to the front (pull end) of the liner during the pull-in procedure.

I. Curing and Cool-Down

After completion of the insertion, shape the liner to the host pipe by pushing a pig through the impregnated tube. Cure the liner using UV, hot water, or steam recirculation. The curing system shall be capable of delivering desired heat uniformly throughout the pipe segment, for a consistent cure of the resin. Water

from the Owner's water system will be available at no cost as needed for the installation and curing process. The Contractor shall be responsible for moving or conveying the water to the work area. The curing temperature shall be as recommended by the resin manufacturer.

The heat source shall be fitted with suitable monitors to measure the temperature of the outgoing and incoming curing water. Curing temperatures and duration shall comply with previously submitted data and information.

The Contractor shall cool the hardened cured-in-place-pipe to a temperature below 100 degrees F before relieving the internal pressure. Careful attention shall be taken not to cool too quickly to eliminate the possibility of thermoshock. Care shall be taken in the release of the internal pressure so that a vacuum will not be developed that could damage the newly installed liner. Cool down process may vary depending on the installation technique of the manufacturer/Contractor.

Document at no greater than 15 minute intervals, the pressure readings, temperature readings and the time of the readings throughout the duration of the curing process from before initiation of pressure and heat and through the cool-down phase. A copy of the documentation shall be provided to the Engineer.

J. Installation Pressures

During installation, pressure shall be maintained in the liner as required by the Manufacturer. Maintain pressure in the liner above the minimum required to hold the tube tight against the host pipe wall and maintain pressure below the maximum allowable so as to not damage the tube. Pressure shall be maintained between minimum and maximum throughout the duration of the installation, curing and cool-down process.

K. Fit/Finish

The finished pipe shall be continuous over the entire length of the pipe segment. The finished liner shall tightly conform to the walls of the host pipe. No gap or annular space between the finished liner and the host pipe shall be allowed or be visible at the access pits or other exposed points within the finished liner section. The finished liner shall be homogenous throughout and free of any protrusions, holes, cracks, etc., which will affect the liner's structural integrity, hydraulic performance, and overall line performance.

L. Hydrostatic Testing of Each Lined Pipe Segment

After installation of the liner in each pipe segment, the new liner shall be hydrostatically tested in accordance with Section 60.02 FURNISH AND INSTALL PIPE. The hydrostatic test shall be accomplished after the liner has been installed in each pipe segment and before the service connections are reinstated robotically and before the pipe segments are reattached to each other or to the existing water system. Hydrostatic testing to 150 psi against existing valves and existing key boxes will not be required.

M. Hydrostatic Testing of Tie-ins, Hydrants and Valves

If feasible, perform the hydrostatic test of the tie-in new pipe and fittings in accordance with Section 60.02 FURNISH AND INSTALL PIPE. In cases where tie-ins are made to existing force mains and existing valves and hydrostatic testing to 150 psi is not feasible, the tie-in connection shall be completed, the force main system shall be activated under system pressure and a visual inspection for leaks at the existing system pressure shall be performed in the presence of the Engineer.

Any portions of the lined force main, new pipe, fittings, tie-in connections or appurtenances that do not pass the pressure test or visual inspection under system pressure shall be repaired and retested as necessary until the system passes the appropriate test.

N. Final Television Inspection

After the liner is inserted and before flushing, the Contractor shall complete a television inspection of the cured in place lined pipe and submit the video and log to the Engineer for review. The final television inspection shall conform to Section 50.07 SEWER CLOSED CIRCUIT TELEVISION INSPECTIONS and to the requirements of this Specification. The entire circumference of the liner and each reinstated service connection shall be observed during the television inspection.

O. Clean Up

After the installation Work has been completed and all testing accepted, the Contractor shall clean up the entire project area. The Contractor shall dispose of all excess material and debris not incorporated into the permanent installation.

P. Sampling, Testing and Documentation

Sampling and testing shall meet the requirements of ASTM F-1216 and shall include the following:

1. Prepare a minimum of two CIPP samples from each diameter of liner installed on the project except that a minimum of two samples is required for each 2,000 feet of liner (for each diameter) installed on the project (i.e.: 3,000 feet of 8-inch liner would require a minimum of 4 samples).
2. Samples shall be large enough to provide a minimum of five specimens.
3. Test for initial tangent flexural modulus of elasticity and flexural stress in accordance with Test Methods ATSM D 790 and meet the requirements of this specification.
4. Verify that the liner thickness of the sample meets the requirements of this specification.
5. Submit test results to the Engineer for review and approval.
6. Samples shall be cut from a section of cured CIPP that has been inverted through a like diameter pipe which has been held in place by a suitable heat sink.

Provide one copy of the pressure, temperature and time readings taken during the installation, curing and cool-down process.

Q. Final Acceptance

The final acceptance for the liner will be based on satisfactory hydrostatic testing and flushing as well as visual observation results of the post-rehabilitation television inspection and satisfactory sampling and testing results.

R. Record Drawing Information

For force main tie-ins and access pits, record the location, dimension, and size of all pipe and fittings and valves in relation to where they are located on the main line. Prepare schematics that show the locations and elevations of the new pipe and fittings. The horizontal and vertical locations of the new pipe and fittings shall be tied into the project pipe station locations. This information shall be recorded on the Contractor redline drawings for incorporation into the project record drawings.

Backfilling and burying of the new pipe and fittings at force main tie-ins and access pits in will not be allowed until the Engineer has reviewed and approved the Contractor prepared field drawings or schematics that describe the new pipe and fitting locations and elevations.

S. Liner Installation Qualified Personnel

The Contractor shall provide personnel who are trained and qualified to install the lining system.

1. The CIPP senior installation supervisor shall be on the project site whenever lining materials are being handled, impregnated with resin or installed.
2. No less than one Contractor personnel who have been trained by the liner manufacturer shall be present at all times at the insertion pit end of the process during the liner resin injection and liner insertion work.
3. No less than one Contractor personnel who have been trained by the liner manufacturer shall be present at all times at the exit location of the lining process if the insertion process includes a liner that is pulled into place (versus inversion).
4. Training of personnel by the liner manufacturer may consist of: 1) “factory training” at the liner manufacturer site or, 2) training by manufacturer or factory personnel at a project site.
5. Experience with installing the lining process may be substituted for training by factory personnel. Contractor personnel who have relevant experience installing no less than 2,000 feet of the lining system will be considered as having the same qualifications as personnel who have been trained by factory personnel.
6. Other non-factory trained Contractor personnel who are performing various tasks during the liner installation including resin injection, resin mixing, equipment operation, etc. shall be competent and qualified to do the work being performed.

T. Liner Installation Documentation

Document and record the installation process for each liner segment. Prepare a standard installation checklist in a written format and submit to the Engineer for review and approval prior to installing the first liner on the project. The checklist shall include at a minimum, the items listed below. Some of the following items may not apply to the lining process being installed and are not required in that case.

1. Project name, Contractor name, date and liner segment identification including the host pipe material and diameter, diameter of liner tube, beginning and ending station of liner.
2. Names of the personnel who worked on this installation and are trained in the lining process.
3. Record the distance into the host pipe ends that have been prepared for lining.
4. Record the compression roller gap. Measurements shall be taken prior to liner installation and after liner has been installed.
5. Record the type and temperature of the resin to be installed in the liner. Temperature measurements shall be taken and recorded for each individual container of resin that is installed in the liner segment.
6. Record in gallons, the amount of resin installed in the entire liner segment.
7. Record the end sealing procedure as complete at liner ends.
8. Record the pig launch time and location and pig received time and location.
9. Record start and stop time of the cold water forming process in the liner.
10. Record start and stop time of hot water cure and the temperature and pressure at both ends of the liner installation. Recordings shall be taken every fifteen minutes.
11. Record post cure start and stop times and system pressures.
12. Record complications that may have occurred during installation.
13. If a CIPP sample is taken for structural testing, record the location of the sample.

The completed checklist for each installed liner segment shall be delivered to the Engineer the next day after a liner segment has finished curing.

Article 14.7 Measurement

No measurement will be made for furnishing and installing the CIPP force main liner in both the 20” and 24” force main pipes.

Measurement for spot repairs will be determined by the length of the repair. A spot repair up to 5 feet long will be considered one (1) spot repair, even if multiple patches are required. Any repair over 5 feet long will be counted as multiple spot repairs and will be measured in multiples of 5 feet.

Article 14.8 Payment

Payment for this Work shall be in accordance with Division 10, Section 10.07 Measurement and Payment.

Unless specifically identified for payment under a separate pay item, the unit price bid includes all labor, equipment, and materials to complete the Work. Payment for furnish and install cured in place pipe liner shall include full payment for all lining Work described in this Section and shall include abandoning valves in place, television inspection work, internal point repairs, construction of intermediate access pits necessary to install the new liner and force main tie-in work including but not limited to the following items: installation of all pipe, dewatering, mechanical compaction, tees, crosses, flanges, bends, adapters, valves, reducers, thrust restraint systems, thrust block systems, thrust anchors and other fittings; adjustment to finish grade; cleaning and flushing; hydrostatic testing; shoring; maintenance and restoration of existing drainage patterns; and miscellaneous items required to complete the Work as shown on the Drawings.

Disposal of unsuitable or surplus material, import earthwork materials, removal and replacement of curb and gutter, sidewalk, topsoil and seeding, landscaping, traffic control, dewatering, asphalt pavement, and anodes shall be considered incidental to this Section.

Unit cost payment shall be made on the following basis:

ITEM	UNIT
Furnish and Install CIPP Force Main Liner (20” & 24”)	Lump Sum
Furnish and Install CIPP Force Main Spot Repair (diameter)	Each

SECTION 50.15 SEWER LINE AND WET WELL CLEANING

Article 15.1 Description

The Contractor shall furnish all labor, materials, and equipment necessary for the proper cleaning of the sewer force mains designated for inspection by closed-circuit television and rehabilitation. Cleaning shall be completed prior to inspection by closed-circuit television and prior to rehabilitation. Sewer cleaning may be performed with high-velocity hydro-cleaning equipment, or mechanical cleaning equipment.

Article 15.2 Materials

High velocity hydro-cleaning equipment shall have the following:

1. A minimum of 900 feet of high pressure hose.
2. Two or more high velocity nozzles capable of producing a scouring action from 10 degrees to 45 degrees in all size lines to be cleaned.
3. A high velocity gun for washing and scouring wet well / overflow reservoir walls and floor with the capability of producing flows from a fine spray to a long distance solid stream.
4. A water tank with a minimum 1000-gallon capacity, auxiliary engines and pumps, and a hydraulically driven hose reel.

5. Equipment operating controls located above ground.
6. Minimum working pressure of 2,000 pounds per square inch at a 50 gpm rate.

Mechanical cleaning equipment shall be either power buckets or power rodders. For bucket machines, furnish with buckets in pairs and with sufficient dragging power to perform the Work efficiently. Use V-belts for power transmission or have an overload device. No direct drive machines will be permitted. Bucket machines shall be equipped with a take-up drum and a minimum of 500 feet of cable.

Article 15.3 Construction

A. Sewer Line and Wet Well Cleaning

The designated force main sewer pipe sections shall be cleaned using high velocity jet, or mechanically powered equipment. Selection of the equipment used shall be based on the condition of the sewer lines and manholes at the time the Work commences. The equipment shall be capable of removing dirt, grease, rocks, sand, pipe coating debris and other materials and obstructions from the sewer lines and manholes. If cleaning of an entire section cannot be successfully performed from one access point, the equipment shall be set up on the other access point and cleaning again attempted. The cleaning Work shall be performed to a level required to provide satisfactory television inspections and to prepare the pipeline for rehabilitation as required in these Contract Documents

The force mains are expected to contain wastewater scum and buildup on the host pipe walls. Scum, sand debris, and gravel debris shall not be flushed downstream and shall be removed from the sewer main as described herein. Any sand and gravel debris particles in excess of ½-inch diameter shall be removed from the host pipe. Any sand and gravel debris in excess of ½-inch deep in the pipe invert shall be removed from the host pipe.

B. Cleaning Precautions

During sewer cleaning operations, satisfactory precautions shall be taken in the use of cleaning equipment. Care shall be exercised to avoid damage to the pipe structure.

The Contractor shall be responsible and repair, at no cost to the Owner, any damage to the structure of a sound sewer pipe caused by use of the sewer cleaning equipment. Further, the Contractor shall be responsible for any damage to properties connected to the sewer which result from the sewer cleaning operation.

Cleaning shall be accomplished so that television inspection and sewer pipe rehabilitation can be properly accomplished, as determined by the Engineer, or the line shall be recleaned at no additional cost to the Owner.

C. Material Disposal

All solids or semisolids resulting from the cleaning operations shall be removed from the site and disposed of by the Contractor. All materials shall be removed from the Work site at the end of each workday. Under no circumstances will the

Contractor be allowed to accumulate debris, etc., on the work site beyond a single workday, except in totally enclosed containers and as approved by the Engineer. The material resulting from the sewer pipe and wet well cleaning operations shall be disposed by the Contractor at the AWWU disposal station for solid or semisolid sewer debris that is located at the AWWU King Street maintenance facility.

D. Water for Sewer and Wet Well Cleaning

Water for sewer cleaning may be obtained from AWWU through fire hydrants at their convenience. No fire hydrants shall be obstructed during water filling operations. All water use must be coordinated by the Contractor with AWWU. The Contractor shall obtain a hydrant permit from AWWU prior to obtaining water from any hydrant. Any damage to the hydrant or water system resulting from misuse by the Contractor shall be repaired by the Contractor at no cost to the Owner.

E. Final Acceptance

Final acceptance of the sewer line cleaning shall be made upon the successful completion of the television inspection as required in these Contract Documents. If television inspection shows the cleaning to be unsatisfactory, the Contractor shall be required to re-clean and re-inspect the sewer line by television inspection until the cleaning is shown to be satisfactory, at no additional cost to the Owner.

Article 15.4 Measurement

No measurement will be made for Work in this Section.

Article 15.5 Payment

No separate payment will be made for Work in this Section. All Work associated with sewer line cleaning for CCTV inspection, lining, and sliplining will be considered incidental to the Contract.

DIVISION 60 WATER SYSTEMS

SECTION 60.01 GENERAL

Article 1.2 Applicable Standards

Add the following items to the list of standards:

ANSI/AWWA C550-05	Standard for Protective Epoxy Interior Coatings for Valves and Hydrants
AWWA M23	PVC Pipe - Design and Installation
ASTM D1784-07	Standard Specification for Rigid Polyvinyl Chloride (PVC) Compounds and Chlorinated Poly Vinyl Chloride (CPVC) Compounds
ASTM D2837-04	Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products

SECTION 60.02 FURNISH AND INSTALL PIPE

Article 2.4 Construction

Add the following to the end of the first paragraph:
The water interruptions should only occur during periods of low water demands, as determined by the Owner. The Contractor shall be responsible for minimizing the interruptions to the water service throughout the project.

Article 2.6 Measurement

Delete this Article and replace with the following:
No measurement will be made for Work in this Section.

Article 2.7 Basis of Payment

Delete the first sentence of the first paragraph and replace with the following:
No separate payment will be made for Work in this Section. All Work associated with Furnish and Install Pipe will be considered incidental to item 50.11 – Pump Station 12 Improvements.

SECTION 60.03 FURNISH AND INSTALL VALVES

Article 3.4 Measurement

Delete this Article and replace with the following:
No measurement will be made for Work in this Section.

Article 3.5 Basis of Payment

Delete the first sentence of the first paragraph and replace with the following:
No separate payment will be made for Work in this Section. All Work associated with Furnish and Install Valves will be considered incidental to item 50.11 – Pump Station 12 Improvements.

SECTION 60.04 FURNISH AND INSTALL FIRE HYDRANTS

Article 4.5 Measurement

Delete this Article and replace with the following:
No measurement will be made for Work in this Section.

Article 4.6 Basis of Payment

Delete the first sentence of the first paragraph and replace with the following:
No separate payment will be made for Work in this Section. All Work associated with Furnish and Install Fire Hydrants will be considered incidental to item 50.11 – Pump Station 12 Improvements.

SECTION 60.05 WATER SERVICE LINES

Article 5.1 General

Add the following sentences to the end of the first paragraph:
Additionally, the Work includes the new water service lines and installation of a new key box (valve).

Replace the first sentence of the third paragraph with the following:
A permit shall be obtained from the Utility Company/AWWU Field Services Division prior to any and all water service construction. Utility Company will pay the cost of water service connect permits.

Article 5.4 Construction

Delete the first sentence of the nineteenth paragraph and add the following:
All water service lines must be flushed, hydrostatically tested, and disinfected before the piping system can be put into service. All flushing, hydrostatic testing, and disinfection of water service lines (including stub-outs) must comply with MASS Section 60.02, Article 2.5 Flushing and Testing.

Article 5.5 Measurement

Delete this Article and replace with the following:
No measurement will be made for Work in this Section.

Article 5.6 Basis of Payment

Delete the first sentence of the first paragraph and replace with the following:
No separate payment will be made for Work in this Section. All Work associated with Water Service Lines will be considered incidental to item 50.11 – Pump Station 12 Improvements.

SECTION 60.06 FURNISH AND INSTALL GALVANIC ANODES

Article 6.1 General

Delete the first sentence of the first paragraph and replace with the following:
The Work under this Section consists of the performance of all Work required for furnishing and installing galvanic anodes for added protection of buried water main and sewer force main fittings, gate valves, and mechanical joint restraints from corrosion.

Article 6.4 Construction

1. Anode Placement

Delete this subarticle and replace with the following:

Anodes are to be installed to protect all buried water main and sewer force main fittings, gate valves, and mechanical joint restraints. Anodes are to be installed eighteen to thirty six (18” to 36”) from the side wall of the pipe, to a centerline depth in lines with the approximate horizontal plane of the pipe’s bottom dead center. One anode on all fittings, gate valves, and mechanical joint restraints

within a twenty foot (20') radius, as long as all components are electrically connected to the anode.

Article 6.5 Measurement

Delete this Article and replace with the following:
No measurement will be made for Work in this Section.

Article 6.6 Basis of Payment

Delete the first sentence of the first paragraph and replace with the following:
No separate payment will be made for Work in this Section. All Work associated with Furnish and Install Galvanic Anodes will be considered incidental to the Contract.

SECTION 60.07 TEMPORARY WATER SYSTEMS

Article 7.1 General

Add the following after the first sentence of the first paragraph of the Temporary Water Plan subparagraph:
The plan shall be delivered to the Engineer within ten working days of the effective date of the Notice-To-Proceed or five working days before the commencement of Work, whichever is the earlier date.

Article 7.6 Measurement

Add the following to the end of the Article:
No measurement will be made for Work in this Section.

Article 7.7 Basis of Payment

Delete this Article and replace with the following:
No separate payment will be made for Work in this Section. All Work associated with Temporary Water Systems will be considered incidental to item 50.11 – Construct Pump Station 12 Improvements.

SECTION 60.08 DECOMMISSION WATER SYSTEM AND COMPONENTS

Article 8.1 General

Add the following to the end of the Article:
Decommissioning of the well shall be in accordance with 18 AAC 80.

Article 8.5 Measurement

Add the following to the end of the Article:
No measurement will be made for Work in this Section.

Article 8.6 Basis of Payment

Delete this Article and replace with the following:
No separate payment will be made for Work in this Section. All Work associated with Decommission Water System and Components will be considered incidental to item 50.11 – Construct Pump Station 12 Improvements.

DIVISION 65 MUNICIPAL CONSTRUCTION SURVEYS

SECTION 65.02 CONSTRUCTION SURVEYING

Article 2.14 As-built Surveys and Record Drawings

Add the following after the third sentence of the first paragraph:
In addition to submitting record drawing redlines, the Contractor shall redline the location of each repaired, relocated or installed water service key box/sewer service, location of water/sewer service tie-in to water/sewer main and other information as required on the Water/Sewer Connect Permit card and approved by the Engineer. The Contractor is to record and transmit to the engineer the location of points in the Work such as but not limited to service connection at the main, connection of the service extension, service length, service invert elevations at the main and property line and distance to nearest property corner, building corner or other permanently fixed objects. Water service key boxes/sewer services will be located from property corners and/or reference points approved by the Engineer, (minimum two (2) swing ties). Contractor shall also record legal description of property (Lot, Block, and Subdivision) as well as street address and date when work was completed. Information shall be recorded on Water/Sewer Connect Permit Card template provided in Section IV in the Contract Documents.

Article 2.16 Measurement

Delete this Article and replace with the following:
No measurement will be made for Work in this Section.

Article 2.17 Basis of Payment

Delete the first sentence of the first paragraph and replace with the following:
No separate payment will be made for Work in this Section. All Work associated with Construction Surveying will be considered incidental to the Contract.

DIVISION 70 MISCELLANEOUS

SECTION 70.01 GENERAL

Add the following new Article:
Article 1.3 Utility Facilities

Prior to commencing any Work covered under this division or impacting utility facilities, the Contractor shall contact the Utility and obtain any permits, approvals, or other conditions as required by the Utility to complete any Work on or in the vicinity of their facilities.

SECTION 70.08 RESET FENCE

Article 8.4 Measurement

Delete this Article and replace with the following:
No measurement will be made for Work in this Section.

Article 8.5 Basis of Payment

Delete the first sentence of the first paragraph and replace with the following:
No separate payment will be made for Work in this Section. All Work associated with Reset Fence will be considered incidental to item 50.11 – Construct Pump Station 12 Improvements.

SECTION 70.12 TRAFFIC MAINTENANCE

Article 12.1 General

Add the following paragraph after the third paragraph:
The Contractor is advised that Dimond Boulevard is an ADOT&PF right-of-way. The Contractor shall be responsible for applying for a Lane Closure Permit from ADOT&PF for all work within the right-of-way. A traffic control plan must be submitted as part of the application. Contact ADOT&PF right-of-way at (907) 269-0700 or (800) 770-5263.

Article 12.7 Traffic Control Devices

Add the following paragraph to the end of the Article:
Temporary painted traffic markings shall be provided when traffic is expected to travel over unmarked pavement for more than 7 days. The painted traffic markings shall be provided at the roadway centerline, at the outside edge of the traveled way, and between lanes at intersections. Painted traffic markings shall meet the requirements of MASS Section 70.10 – Traffic Markings.

Article 12.10 Measurement

Delete this Article and replace with the following:
No measurement will be made for Work in this Section.

Article 12.11 Basis of Payment

Delete the first sentence of the first paragraph and replace with the following:
No separate payment will be made for Work in this Section. All Work associated with Traffic Maintenance will be considered incidental to the Contract.

DIVISION 75 LANDSCAPING IMPROVEMENTS

SECTION 75.02 LANDSCAPING

Article 2.6 Measurement

Delete this Article and replace with the following:
No measurement will be made for Work in this Section.

Article 2.7 Basis of Payment

Delete the first sentence of the first paragraph and replace with the following:
No separate payment will be made for Work in this Section. All Work associated with Landscaping will be considered incidental to the Contract.

SECTION 75.03 TOPSOIL

Article 3.4 Measurement

Delete this Article and replace with the following:
No measurement will be made for Work in this Section.

Article 3.5 Basis of Payment

Delete the first sentence of the first paragraph and replace with the following:
No separate payment will be made for Work in this Section. All Work associated with Topsoil will be considered incidental to the Contract.

SECTION 75.04 SEEDING

Article 4.1 General

Add the following paragraph to the end of the Article.
The Contractor shall submit to the Engineer an analysis of all seed mixes 10 days prior to application. All seeded areas shall be mulched.

Article 4.6 Measurement

Delete this Article and replace with the following:
No measurement will be made for Work in this Section.

Article 4.7 Basis of Payment

Delete the first sentence of the first paragraph and replace with the following:
No separate payment will be made for Work in this Section. All Work associated with Topsoil will be considered incidental to the Contract.

Add the following New Section:

SECTION 75.12 SITE RESTORATION AND SOIL STABILIZATION

Article 12.1 General

The Work covered under this Section shall consist of all operations pertaining site restoration and soil restoration of the staging area shown on the drawings.

The Contractor shall submit for approval the soil stabilization method and materials prior to beginning work.

Article 12.2 Materials

Soil stabilization materials shall be free of noxious weeds, seeds, chemical printing ink, germination and growth inhibitors, herbicide residue, chlorine bleach, and other deleterious materials. Materials shall not be harmful to plants, animals, and aquatic life.

Wood cellulose "paper" fiber, sawdust, and hay are not permitted as stabilization materials.

Acceptable soil stabilization materials are either wood chips generated from trees cleared in the staging area, or tackifier as identified below. Mixing wood chips from different staging areas is not acceptable.

A. Tackifier.

Tackifier, viscous overspray, generally composed of dry powered vegetable gums derived from guar gum, psyllium and sodium alginase; asphaltic emulsions; petroleum distillates; co-polymer emulsions; and lingo sulfonates and used to anchor soil, compost, seed, the mulch fibers to one another, and the ground. Contain no growth or germination inhibiting materials nor significantly reduce infiltration rates. Tackifier shall hydrate in water and readily blend with other slurry material. Tackifier options include:

1. Type A. Organic tackifier with certification of plant sources; or

2. Type B. Synthetic tackifier with certification confirming product is not harmful to plants, animals, or aquatic life.

Article 12.3 Construction

At the completion of the project but prior to demobilizing from the site, the Contractor shall re-grade the staging area to original contours, within 6-inches of original elevation. Soil stabilization materials (wood chips or tackifier) shall cover the staging area prior to demobilization.

If the Contractor elects to use wood chips for soil stabilization, the wood chips shall be kept on site and shall be kept separate from the vegetative mat stockpiles.

Wood chips shall cover the staging area to prevent the disturbed surface from eroding during the spring thaw. The Contractor will be required to use a tackifier if the wood chips do not cover 90% of the staging area.

Tackifier shall be applied at the coverage rates according to the manufacturer's installation instructions.

Article 12.4 Measurement

Delete this Article and replace with the following:
No measurement will be made for Work in this Section.

Article 12.5 Basis of Payment

Delete the first sentence of the first paragraph and replace with the following:
No separate payment will be made for Work in this Section. All Work associated with Site Restoration and Soil Stabilization will be considered incidental to the Contract.

END OF SPECIAL PROVISIONS

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 SEWER IMPROVEMENTS

PUMP STATION 12 FORCE MAIN / INTERCEPTOR C GRAVITY JUNCTION REHABILITATION

SECTION III

TECHNICAL SPECIFICATIONS

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 SEWER IMPROVEMENTS

PUMP STATION 12 FORCE MAIN / INTERCEPTOR C GRAVITY JUNCTION REHABILITATION

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2022 SEWER IMPROVEMENTS

PUMP STATION 12 FORCE MAIN / INTERCEPTOR C GRAVITY JUNCTION REHABILITATION

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SECTION 01 11 00 – SUMMARY OF WORK

PART 1 - GENERAL

1.1 BACKGROUND INFORMATION

A. The Anchorage Water and Wastewater Utility (OWNER) owns and operates Pump Station 12 (PS12) Facilities. This pump station transfers sanitary sewage, collected at PS12, to a gravity sewer interceptor at Dimond Blvd and Lakehurst Drive via dual force mains. These facilities were constructed during the 1970's and although they have been periodically updated, many of these facilities are original. This project is intended to repair and upgrade the PS12 facilities for another 30-year design life.

B. **BID SCHEDULES** –

The Work to be performed under this Contract is divided into three Bid Schedules:

1. Schedule A -- Pump Station 12 Rehabilitation
2. Schedule C – Access Drives
3. Schedule D – Force Main Rehabilitation.

1.2 GENERAL

A. Specifications and Drawings in these Contract Documents establish the performance, quality requirements, location, and general arrangement of materials and equipment, and establish the minimum standards for quality of workmanship and appearance.

B. Piping, mechanical, and electrical work shown on the Drawings is intended to be depictive and may not be an exact and complete representation of the actual finished work. Include fittings, joints, supports, hardware, and other appurtenances and accessories to provide complete and functioning systems.

C. The CONTRACTOR will supply all labor, tools, equipment, materials, supplies, and manufactured articles, transportation, and services, including fuel, power, water, and essential communications, for performing all work or other operations required for the fulfillment of the Contract in strict accordance with the Contract Documents.

D. When in these Supplemental Technical Specifications there is reference made to General Requirements or General Conditions, this shall refer to the requirements of Division 01 of these Supplemental Technical Specifications. Where reference is made to General Provisions or Special Provisions, this shall refer to the MASS Division 10.00.

1.3 RELATED SECTIONS

A. Municipality of Anchorage Standard Specifications (MASS) dated 2015, and Special Provisions.

B. All Technical Specifications, Division 01 through Division 43

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. This section generally describes the project and the work to be performed under this Contract for the Pump Station 12 and Force Main Rehabilitation. Detailed requirements and the full extent of the Work are described in applicable specification sections and shown on the Drawings.

B. **SCHEDULE A – PUMP STATION 12 REHABILITATION;** This work site is the Pump Station 12 site and surrounding grounds and access ways. The Work of this Lump Sum bid item includes, but is not limited to, the selective demolition, and furnishing and installing of the following:

1. Demolition of two 150 HP wastewater pumps.
2. Installation of two new 200 HP wastewater pumps with new concrete bases, steel pump stands, piping and valves.
3. Reinstallation of two existing 200 HP wastewater pumps with new steel pump stands, piping and valves.
4. New VFD controls, and new and updated electrical power supply.
5. New hydraulic valve actuator control system with SCADA links.
6. Bypass pumping and refurbishing of Influent Manhole and two wet wells, including three new sluice gates and new stainless steel platforms and ladders.
7. Some architectural modifications and addition of a new electric sluice gate operator.
8. Demolition of an existing hydro-pneumatic tank, replumbing and proper abandonment of the existing water well.
9. Coating of influent manhole and wet wells. Repainting equipment and facilities.
10. Install new 6” water service and hydrant.
11. Site work including; grading an access ramp down to low lands, fencing and gates, repaving and landscaping.

C. **SCHEDULE C – ACCESS DRIVES;** This lump sum bid item will include construction of a maintenance access drive originating at North Point Drive extending North and South along the 20-foot force main easement, approximately 600 feet. North Point Drive access will require new fencing and a new swing gate. Details:

1. Refer to Section 20.02 – Storm Water Pollution Prevention Plan
2. Conduct excavation and placement of roadway embankment as shown in the plans.

3. Develop access to North Point Drive located in sewer easement. Use existing private driveway and electric security gate, maintain access for property owner. Provide additional paving and new swing gate in chain link fence.

4. Provide topsoil and seeding as shown.

D. **SCHEDULE D – FORCE MAIN REHABILITATION;** This work will be paid using a combination of lump sum and unit price bid items. This work area extends from PS12 to the discharge into the gravity interceptor at the intersection of Dimond Blvd and Lakehurst Drive. Much of this alignment is located in a 20-ft wide sewer easement. Work includes installation of two new class B manholes and pipeline assessment of 2600 ft of 24-in DIP. Installation of a Type C manhole junction box at the south side of Dimond Blvd. Sliplining 90 ft of 4-ft diameter concrete pipe at the Dimond Blvd crossing and rebuild a type B manhole on the north side of Dimond Blvd. CIPP line 350 ft of 20-inch and 24-inch DIP at the south side of the Dimond Blvd ROW. Provide CIPP Spot repairs and additional rehabilitation that may be identified in assessment of remaining 24-inch pipe.

1. Refer to Section 20.02 – Storm Water Pollution Prevention Plan

2. Install two new type B force main manholes as shown in the plans. The manholes and DIP pipe and fittings have been purchased by the owner and are available for pick-up at the AWWU King Street maintenance yard.

3. After installation of the manholes, clean and provide closed circuit TV assessment of the 2600 ft portion of the 24-inch DIP force main that was previously inaccessible.

4. Demo the old junction box where the force mains discharge into the gravity main and install a new Type C manhole / junction box. The junction box is located on the south side of Dimond Blvd in the Carrs driveway.

5. Slipline the 90 ft of 48-inch RCP that crosses Dimond Blvd. with 36-inch HDPE. This will require rebuilding the Type B manhole on the north side of Dimond in the Lakehurst Drive curb return. DOT utility permit required with traffic control plan. Mitigation measures are required for neighboring businesses.

6. CIPP line 350 ft segment of 20-in and 24-in DIP force main located at the south edge of the Dimond Blvd ROW. Extend from the new Junction Box to a dig-up at the angle point 150 ft east of Strathmore Drive.

7. Provide CIPP spot repairs at locations where force main damage has been identified.

E. Coordination

1. Coordinate with OWNER with proposed work plan to identify times when wastewater pumping can be interrupted to facilitate work scope upgrades.

2. Coordinate with OWNER to identify mobilization and staging areas needed for execution of the work scope.

3. Coordinate with OWNER any proposed alarm system shutdowns.

F. For Work at Construction Site

1. Prepare submittals and secure approvals for elements of the Work required by the Contract Documents.
2. Perform cleaning, flushing, and pressure testing of all process piping systems and process equipment.
3. Support manufacturers' review of installed equipment for certification of proper installation.
4. Complete the corrective action items identified for the installed equipment by the manufacturers.
5. Verify and demonstrate function and performance of installed materials and equipment.
6. Provide support services for manufacturers in their efforts to start up and demonstrate the performance of the equipment, troubleshoot performance issues, and provide training on equipment operation.

1.5 PROJECT CONSTRAINTS

A. CONTRACTOR shall furnish a Work Plan that describes the CONTRACTOR's phasing, and sequence of demolition and construction activities, equipment proposed for use, and the constraints of each of the various areas of Work. The Work Plan must identify those activities that may be performed concurrently and those that must be deferred or delayed until completion of other activities. The Work Plan must complement the CONTRACTOR's schedule, each to be developed in accordance with the Contract Documents.

1. There are several elements to the Work that will temporarily remove capacity and/or redundancy in the wastewater pumping system (i.e., taking force main out of service, taking pumps out of service, lengthy bypass operations, etc.). The Work Plan shall give special consideration to these Work elements and shall manage the risk of a sewage overflow by not performing concurrent operations that reduce capacity and/or redundancy.

B. The existing wastewater facilities will be maintained in continuous operation during construction of the Project, except for limited shutdowns as described herein. To this end, the CONTRACTOR shall establish a schedule of proposed shutdowns in cooperation with the ENGINEER and OWNER's operating staff, which shall be updated when needed and shall be approved by the ENGINEER.

C. The existing wastewater pumping facilities where CONTRACTOR's work is to be done will be operational throughout the construction period. The CONTRACTOR shall provide all necessary access to OWNER's personnel as required to safely and efficiently operate/maintain the facilities. At all times during the Contract duration, the CONTRACTOR is to provide the OWNER's personnel and representatives safe and immediate access to all equipment. Additionally, the CONTRACTOR is to provide for unimpeded access for all delivery vehicles transporting materials, chemicals and equipment to the facility for the OWNER's operations.

D. The CONTRACTOR shall minimize shutdown times through advanced planning. Work shall not proceed prior to the approval of associated submittals as specified in the Contract Documents. For example, piping installation drawings shall be approved prior to the initiation of piping installation, etc. CONTRACTOR shall have all equipment, materials, and labor on hand at time of shutdown.

E. Discharge of untreated or partially treated wastewater is not permitted.

1.6 SHUTDOWNS

A. Shutdowns of pumping operations shall be accomplished by the CONTRACTOR in cooperation with the O&M Superintendent/Foreman only when properly coordinated in advance by the CONTRACTOR with the OWNER and ENGINEER in accordance with the requirements of this section and the Contract Documents.

B. Shutdowns shall be initiated and completed only during normal working hours of plant operating personnel, or as otherwise coordinated with and approved by the OWNER.

C. Pumping shutdowns shall not exceed eight (8) hours and shall be coordinated with and approved by the OWNER/O&M Superintendent at least 5 days prior to shut down, unless otherwise coordinated with and approved by the OWNER/O&M Superintendent. The pumping shutdown may need to occur during the time of day, and day of the week when the pump station receives its lowest wastewater flow. Pump Station 12 generally receives its lowest wastewater flow between 12:00 midnight and 5:00 am on Sundays, excluding holidays.

D. For shutdowns exceeding two (2) hours, the CONTRACTOR shall submit a detailed plan outlining the construction sequence, schedule of installation, and proposed bypass system at least 30 days prior to the scheduled outage for approval by the OWNER.

E. Power outages required to perform the work shall be coordinated with the overall construction schedule and shall meet the conditions specified in this section and the following restrictions:

1. The CONTRACTOR shall provide temporary power to minimize pumping outage in accordance with the requirements of specification 26 05 00 – Electrical Work, General.
2. CONTRACTOR to obtain approval at least 10 days in advance before any power outage
3. The existing standby generator can be utilized sparingly for temporary outages, in accordance with the requirements of specification 26 05 00 – Electrical Work, General.

1.7 SEQUENCE OF ACTIVITIES

A. The initiation of demolition Work will only be allowed after CONTRACTOR's submission and ENGINEER's review and approval of the detailed construction schedule and the CONTRACTOR's Narrative Work Plan.

B. Demolition Work should be scheduled to end with the arrival of the materials and the equipment planned for installation in the various areas.

C. The intent of the sequence of activities is the orderly progression of the Work with a minimization of temporary facilities, the completion of activities in a logical fashion that eliminates rework, coordination of all new installations to complete the overall project within the time frame outlined in the contract documents.

D. The sequence of activities for the overall Work are intended to be executed while the pump stations are operational, supplying adequate pumping of wastewater at all times. CONTRACTOR shall sequence Work to minimize interruption to pump station operation.

E. CONTRACTOR shall coordinate with OWNER for needed pump station lockout and returning pump station to service. OWNER will lead in these activities with CONTRACTOR's participation and assistance.

F. CONTRACTOR shall be aware that the well pump, hydro-pneumatic tank, and air compressors will need to be operational to actuate the knife gate valves in the station. The knife gate valves are critical valves, both for operation of the pump station and for construction sequencing. The existing pressure system must remain operational until the new water service to the pump station has been commissioned. Refer to specification 26 05 00 – Electrical Work, General for more information.

1.8 SEQUENCE OF CONSTRUCTION

A. The OWNER must continue to operate the wastewater pumping system, except for limited shutdowns. As such, this sequence of construction provides a scenario where interruptions to pump station operations are minimized, by providing temporary work-arounds as needed, and completing major portions of construction prior to making relatively quick cut-ins while temporarily interrupting process flows.

B. There are operational and contractual constraints to the progression of the Work. The sequence of activities outlined herein is not mandatory as presented and shall not be interpreted to preclude CONTRACTOR's alternative approaches to sequencing the Work. The CONTRACTOR shall utilize a scenario such as presented, to prepare and submit the CONTRACTOR's work plan that optimizes efficiency for the CONTRACTOR while limiting operational impacts to the OWNER.

C. A general Sequence of Construction for major Work items of the Pump Station 12 Force Main / Interceptor C Gravity Junction Rehabilitation project:

1. Complete submittals and order equipment.

2. Setup and commission sewer bypass to facilitate the rehabilitation of the Influent Manhole, Wet Well #1, and Wet Well #2 (portion of Schedule A – Pump Station 12 Rehabilitation). Work includes replacement of sluice gates, stems, brackets, actuator, platforms and structural members, interior wall relocation, roll-up door, and coating of manhole and wet well walls. Refer to Section 50.05 – Sanitary Sewer Flow Control, Article 5.4 for an example bypass plan.

3. Disassemble bypass and complete remainder of Schedule A process work. Example sequence:

    a. Open sluice gate between wet wells so all four pumps are available to handle the inflow.

    b. Complete and commission new water service portion of Schedule A civil and process work, in order to maintain hydraulic actuation of knife gate valves during Electrical work. Minimize switch over time from onsite well to new water service. Demo existing hydropneumatic tank in pump station building and properly abandon well.

    c. Isolate Pump #1 and Pump #4 from the system using knife gate valves. Pump #2 and Pump #3 to remain in service. Complete Pump #1 and Pump #4 (and accessories) demolition. Install new pumps, pump bases, pump stands, piping, check valve, thrust blocks, and electrical improvements. See 26 05 00 – Electrical Work, General for example electrical work sequencing. Commission new Pump #1 and new Pump #4.

    d. Isolate Pump #2 and Pump #3 from the system using knife gate valves. Pump #1 and Pump #4 to remain in service. Complete demolition of Pump #2 and Pump #3 accessories. Reinstall existing pumps. Install new pump stands, piping, check valve, thrust blocks, and electrical improvements. See 26 05 00 – Electrical Work, General for example electrical work sequencing. Commission Pump #2 and Pump #3.

    e. Alternate force mains to facilitate installation of the air / vacuum release valves. Plumb valve drains into the wet well.

4. Complete Schedule A mechanical work, including valve control piping and standby booster pump.

5. Complete the remainder of the Schedule A civil work, including driveway replacement paving & gate, Turnagain Trunk access ramp, fencing & gates, painting, and landscaping improvements.

6. Complete Schedule C – Access Drives work. Install manhole 78A.

7. Complete Schedule D – Force Main Rehabilitation work and install manhole 79A. Refer to Section 50.09 – Slipline Sanitary Sewer Gravity Crossing, Article 9.5 for work plan example. Alternating of force mains and pump station shut-downs will likely be required.

1.9 REQUIREMENTS FOR SUBSTANTIAL COMPLETION

A. The following conditions, in addition to the requirements in MASS Division 10, shall be fulfilled before the Work is considered substantially complete:

1. Submittals have been completed and approved.

2. Spare parts and expendable supplies and test equipment have been delivered to OWNER.
3. Pre-final Punch-list items have been corrected.
4. Red-lines/record drawings in both hard-copy and electronic format have been submitted and approved.
5. Revisions to the Technical Manuals that may have resulted from the field tests have been made and reviewed and approved.
6. Construction debris has been removed.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 33 00 – SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 GENERAL

A. Inquiries: Direct submittal inquiries to ENGINEER regarding procedure, purpose, or extent of Submittal.

B. OWNER's Authorization: At any time, OWNER may authorize changes to procedures and requirements for Submittals. Such authorization will be in writing.

C. Timeliness: Schedule and make submissions in accordance with requirements of individual Specification sections and in such sequence as to cause no delay in Work or in work of other contractors. CONTRACTOR shall have the completed and approved submittals and shop drawings on site prior to installation of such materials into the Work.

D. Identification of Submittals

1. Complete, sign, and transmit with each Submittal package, one Transmittal of Contractor's Submittal Form, and a copy of the CONTRACTOR's submittal log pertaining to submitted section.
2. Submittal Number Format: SS SS SS-NNN-V.
    a. SS SS SS: Specification Section under which information is submitted
    b. NNN: Sequential Submittal Number (01 through 999).
    c. V: Resubmission version with sequential alphabetic suffix.
3. Format: Orderly, indexed with labeled tab dividers.
4. Show date of submission and dates of previous submissions.
5. Show Project title and OWNER's contract identification and number and Project ID number.
6. Show names of CONTRACTOR, Subcontractor or Supplier, and manufacturer as appropriate.
7. Identify Contract Document section and paragraph to which Submittal applies.
8. Identify whether or not the submitted item or items are a substitution or an or-equal alternative to the item specified in the Contract Documents.
9. Clearly identify revisions from previous submissions.
10. When a submittal package spans several sections, submit each item under its respective specification heading and paragraph. Clearly note on each item transmittal that it is part of a larger package and include references to the additional submittals made in the relevant sections.

E. Incomplete Submittal Submissions

1. At ENGINEER'S sole discretion, ENGINEER will either:
    a. request the entire Submittal be revised and resubmitted with CONTRACTOR's revision/correction and resubmission, or
    b. request only portions of the Submittal be revised and resubmitted for review.
2. Stamp each submittal with uniform approval stamp before submitting to ENGINEER. Stamp to include CONTRACTOR's reviewer name, date of CONTRACTOR's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with Contract Documents.
3. Submittals which do not clearly bear CONTRACTOR's specific written indication of CONTRACTOR review and approval of Submittal or which are transmitted with an unsigned or uncertified submission form or as may otherwise be required under Contract Documents, will be returned to CONTRACTOR unreviewed for resubmission in accordance with Contract Documents.
4. Delays, re-sequencing, or other impact to Work resulting from CONTRACTOR's submission of unchecked or unreviewed, incomplete, inaccurate or erroneous, or nonconforming Submittals, which will require CONTRACTOR's resubmission of a Submittal for ENGINEER's review, shall not constitute a basis of claim for adjustment in Contract Price or Contract Times.

F. Electronic Submittal Service and Procedures
1. The CONTRACTOR may transmit shop drawing and product data submittals to OWNER in electronic (PDF) format.
2. The intent of electronic submittals is to expedite the construction process by reducing paperwork, improving information flow, and decreasing turnaround time.
3. The electronic submittal process is not intended for color samples, color charts, or physical material samples. The physical submittals must be delivered to the OWNER/reviewer as directed (contact Engineer Project Lead for address for mailing).
4. Examples of Project Submittals and documents that may be transmitted electronically include, but are not limited to:
    a. Submittals: Administrative, Product Data, Shop Drawing, and Record Drawing Submittals
    b. Substitution Requests (SRs)
    c. Design Clarification/Verification Requests (DCVRs)
    d. Change Orders and Field Orders
    e. Proposals 1) In response to Requests for Proposals (RFPs) 2) In response to Change Orders (COs)
    f. Meeting Minutes
    g. Daily Reports from Field Observation

h. Site Photos

5. Procedures:

a. CONTRACTOR shall review and apply stamp certifying that the submittal complies with the requirements of the Contract Documents including verification of manufacturer / product, dimensions and coordination of information with other parts of the work.

b. Architect / Designer / Engineer completed review comments will be emailed to the CONTRACTOR.

c. Distribution of reviewed submittals to subcontractors and suppliers is the responsibility of the CONTRACTOR.

d. In addition to electronic submissions, submit paper copies of the Certificates of Installation, Final Technical Manuals, Spare Parts Lists, Marked-up Record Drawings, and Quality Control Submittals as described later in this Specification.

G. Non-specified Submissions: Submissions not required or requested under these Contract Documents will not be reviewed and will be returned to CONTRACTOR.

H. Disposition of Submittals: ENGINEER will review and indicate requirements for resubmission or acceptance on Submittal as follows:

1. No Exceptions Taken (NET)

a. The submittal was reviewed and no exceptions were taken.

b. The Work may proceed may proceed without modification.

2. Make Corrections Noted (MCN)

a. The submittal was reviewed and annotations made to clarify the information submitted.

b. The Work may proceed with the clarifications and corrections made to the information submitted.

3. Amend and Resubmit (AR)

a. The submittal was reviewed and comments made to identify incorrect submitted information.

b. The CONTRACTOR is to revise the submittal and resubmit for further review by the ENGINEER.

4. Rejected: Resubmit (RR):

a. The submittal was reviewed and found to be unacceptable.

b. The CONTRACTOR is to revise the submittal and resubmit for further review by the ENGINEER.

I. ENGINEER’s Review: ENGINEER will act upon CONTRACTOR’s Submittal and transmit response to CONTRACTOR not later than fifteen (15) working days after receipt, unless: (i) specified otherwise or (ii) accepted by ENGINEER as set forth in Paragraph ENGINEER’s Duties below and identified on current accepted submissions. Re-submittals will be subject to the same review time.

J. ENGINEER's Duties

1. Review Submittals with reasonable promptness and in accordance with current accepted submissions from CONTRACTOR's Project Manager.

    a. No adjustment of Contract Times or Price will be allowed due to ENGINEER's review of Submittals, unless all of following criteria are met:

        1) CONTRACTOR has notified ENGINEER in writing that timely review of Submittal in question is critical to progress of Work, and has received ENGINEER's written acceptance to reflect such on current accepted submissions and progress schedule. Written agreement by the ENGINEER to reduce the above Submittal review time will be made only for unusual and CONTRACTOR - justified reasons. Acceptance of a progress schedule containing Submittal review times less than specified above or less than agreed to in writing by ENGINEER will not constitute ENGINEER's acceptance of the review times.

        2) ENGINEER has failed to review and return the first submission of a Submittal within the agreed time indicated on current accepted schedule of submissions or, if no time is indicated thereon, within twenty-one (21) calendar days.

        3) CONTRACTOR demonstrates that delay in progress of Work is directly attributable to ENGINEER's failure to return Submittal within time indicated and accepted by ENGINEER.

    b. No adjustment of Contract Times or Price will be allowed due to delays in progress of Work caused by rejection and subsequent resubmission of Submittals, including multiple resubmissions.

2. Indicate the disposition of submittal reviews as set forth above.

3. Indicate requirements for resubmission as required.

4. Post reviewed submittals with review comments on the web based document exchange service provided for the Project.

K. Excessive Review

1. Review of the first submission and two resubmissions of Shop Drawings, test procedures, training plans, and O&M manuals will be performed by ENGINEER and ENGINEER's Consultants, as appropriate, at no cost to CONTRACTOR.

2. Subsequent additional resubmissions of such Submittals will be reviewed by ENGINEER and ENGINEER's Consultants; however, ENGINEER will document work hours and other expenses required to perform such additional review(s) and CONTRACTOR shall reimburse OWNER for these costs.

1.2 SHOP DRAWINGS

A. CONTRACTOR Shop Drawing Submittals to Identify and Indicate:

1. Pertinent Drawing sheet(s) and detail number(s), products, model numbers, part numbers, units and assemblies, and system or equipment identification or tag numbers.
2. Mark out information not germane to this project or include clear indication of only specific elements intended for this Project.
3. Field dimensions and relationships to other critical features of Work

B. Resubmissions: Clearly identify each correction or change made from the previous submittal.

C. Foreign Manufacturers: When proposed, include following additional information:

1. Names and addresses of at least two companies closest to Project that maintain technical service representatives.
2. Complete inventory of spare parts and accessories for each piece of equipment.

D. All Manufacturers: Complete Inventory of spare parts and accessories for each piece of equipment.

E. Preparation

1. Format: Whenever possible, schedule for and combine Shop Drawings required for submission in each specification section or division into a single Submittal package. Also combine product data for like items into a single Submittal package.
2. Present in a clear and thorough manner and of sufficient detail to show kind, size, arrangement, and function of components, materials, and devices and compliance with Contract Documents. Identify details by reference to sheet and detail, and schedule or room numbers shown on Drawings.
3. Reproducible Copy:
    a. Submittal Quantities: Six copies to the ENGINEER.
    b. Preferred Minimum Sheet Size: 8-1/2 by 11-inch and 11 by 17-inch pages, suitable for photocopying.
    c. Larger than 11 by 17-Inch Sheets: 22-inch by 34-inch paper preferred.
4. Electronic Drawing File Format: single file no greater than 10 MB, AutoCAD or PDF.
5. Piping and Piping Support Systems, and Seismic Bracing: Drawn to scale.
6. Product Data: Clearly mark each copy to identify pertinent products or models and show performance characteristics and capacities, dimensions and clearances required, wiring or piping diagrams and controls, and external connections, anchorages, and supports required. The CONTRACTOR shall complete the Item Data Sheet at the end of this Section.

7. Equipment and Component Titles: Identical to title shown on Drawings.

8. Manufacturer's standard schematic drawings and diagrams as follows:

   a. Modify to delete information that is not applicable to Work.

   b. Supplement standard information to provide information specifically applicable to Work.

F. Design Data

1. Provide an appropriately licensed professional engineer to perform design, oversee preparation of Shop Drawings, manufacturing, and installation, as appropriate, and to stamp and certify Shop Drawings conform to design requirements and requirements of Laws and Regulations and governing agencies.

2. When specified, provide Project-specific information as required and as necessary to clearly show calculations, dimensions, logic and assumptions, and referenced standards and codes upon which design is based.

1.3 SAMPLES

A. Submit to ENGINEER

B. Description: Physical examples of materials, equipment, or workmanship that are representative of some portion of Work and that establish the standards by which such portion of the Work will be judged.

C. Copies: Submit two copies to ENGINEER, unless otherwise specified in individual Specification section or in sufficient quantity and of size to enable examination as required and to establish quality or equality thereof.

D. Reference: Meet requirements specified in Contract Documents.

E. Procedure: Submit in accordance with current accepted submissions so as not to delay Work and with sufficient time to allow examination.

F. CONTRACTOR: Responsible for safe and proper delivery of Samples and to prepay cartage charges. Submit additional Samples as may be required.

G. Identification: Clearly indicate Specification section, source, location, date taken, by whom, certification as required, and other appropriate information to facilitate ENGINEER's review.

H. Use: Approved Sample items may be incorporated into Work when no longer needed by ENGINEER for reference.

1.4 QUALITY CONTROL SUBMITTALS

A. Submit to OWNER and ENGINEER.

B. Schedules required by Contract Documents, including Work Plan.

C. Application package(s) for permits and approvals necessary for construction, including CONTRACTOR submitted review documents to the ADOT&PF ROW Department, and resulting permits/approvals.

D. Certificates

1. Manufacturer's Certificate of Compliance

a. When specified in individual specification sections or where products are specified to a recognized standard or code, submit prior to shipment of product or material to the site.

b. Signed by product manufacturer certifying that materials, manufacture, and product specified conforms to or exceeds specified requirements and intent for which product will be used. Submit supporting reference data, affidavits, and certifications as appropriate.

2. Certificates of Successful Testing or Inspection: Submit when testing or inspection is required by Laws and Regulations or governing agency or specified in the individual specification sections.

E. Written procedures for maintaining and markup of record documents per the requirements of the Contract Documents.

F. Written Test Reports of Each Test and Inspection: As a minimum, include the following:

1. Date of test and date issued, project title and number, testing laboratory name, address, and telephone number; and name and signature of laboratory inspector.

2. Date and time of sampling or inspection, and record of temperature and weather conditions.

3. Identification of product and Specification section, location of Sample, test, or inspection in the Project; type of inspection or test with referenced standard or code, certified results of test.

4. Compliance with Contract Documents, and identifying corrective action necessary to bring materials and equipment into compliance.

5. Provide an interpretation of test results, when requested by ENGINEER.

1.5 OPERATION AND MAINTENANCE MANUAL

A. As required by specific technical specifications sections and Drawings, and as required herein.

1. 8-1/2 x 11-inch, three-ring bound manual. Four copies of Final Submittal.

2. Electronic form-factor on compact disk: PDF format.
3. Preliminary submittal: Submit at least 15 days prior to request for final inspection. In the case of equipment being placed in service prior to project completion, submit the manual at least 15 days in advance of the service date at which CONTRACTOR would have OWNER personnel assume operational control. Including, but not limited to: new pumps, new valves and electrical equipment.
4. Final submittal: Submit within 10 days of final inspection.
5. For each piece of equipment or system, provide a description of component including controls, accessories, and appurtenances; identify component by its Maximo and Tag Numbers, and include:
    a. Safety precautions.
    b. Function, normal operating characteristics, and limiting conditions.
    c. Performance curves, engineering data, nameplate data, and test information and results.
    d. Installation and operation instructions.
    e. Alignment, adjustment, calibration, and programming requirements.
    f. Actual control and alarm set points used in this installation.
    g. Startup, normal operation, and trouble-shooting procedures.
    h. List of recommended lubricants, spare parts, and special tools.
    i. Parts list, parts numbers, and ordering instructions with contact names, phone numbers, and addresses.
    j. Maintenance and overhaul procedures.
    k. Assembly diagrams and procedures for removal, repair, and reinstallation or reassembly.
    l. Electrical interconnecting wiring diagrams, including power and control systems.
    m. Maintenance Summary form for each applicable piece of equipment. An electronic copy of this form will be furnished upon request.
6. For each material or finish system described in these specifications, provide:
    a. Catalog or product number
    b. Manufacturer’s data on coating system, including chemical compositions, applicable standards, and details of installation
    c. Manufacturer’s recommendations for inspection, care, maintenance, repair, and cleaning of coating system

1.6 CONTRACT CLOSEOUT SUBMITTALS

A. In accordance with Contract Documents.

1.7 SUBSTITUTE AND “OR-EQUAL” PRODUCTS

A. Meet the requirements of the Standard General Provisions as modified by the Special Provisions, the Specification sections, and as set forth herein.

B. Indicate for each item the status (substitute or “or-equal”) and submission date.

C. Include all supporting data to allow ENGINEER's review. Complete, sign, and transmit with each proposed substitute or “or-equal” item/method submission.

D. Disposition procedure of “Or-Equal” Item: In accordance with specification section under paragraph “Disposition of Submittals”.

1.8 SUPPLEMENT

A. The Transmittal of Contractor’s Submittal form included in Part IV of the Specifications and Contract Documents (Volume 1) is part of this specification.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 75 00 – STARTING AND ADJUSTING

PART 1 - GENERAL

1.1 GENERAL

A. The CONTRACTOR shall perform facility Starting and Adjusting as described herein.

B. Equipment and systems startup and testing shall be done in accordance with the requirements of the applicable specification Divisions.

1.2 RELATED SECTIONS

A. Municipality of Anchorage Standard Specifications (MASS), Special Provisions, and Division 1 - General Requirements apply to Work of this Section.

B. 01 11 00 – Summary of Work

C. 01 33 00 – Submittal Procedures

D. Division 26 – Electrical

E. 40 05 07 – Hangers and Supports for Process Piping

F. 40 05 53 – Process Valves

G. 40 23 40 – Sanitary Wastewater Process Piping

H. 43 23 00 – Dry Location Liquid Pumps

1.3 DEFINITIONS

A. Facility Startup: Facility Startup is the process of putting the Project in operating order. Items of Work to be completed prior to Facility Startup include demolition of the existing system, procurement and installation of the new system, cleaning, flushing, and pressure testing. Facility Startup is to include the following items:

1. Verification by equipment manufacturer(s) that their equipment is properly installed and ready for startup.
2. Confirmation that all electrical power and control communications connections are correctly terminated.
3. Configuration of all instrumentation and control devices, and rotating equipment operation upon being energized.
4. Confirmation of process flow rates over the entire range of specified system operating conditions.

5. Supporting the OWNER in confirmation of control system operation and equipment performance for all specified control sequences.
6. Operation of the system over the period specified for Facility Startup to verify system operation and performance.
7. Performance Testing to verify performance goals specified for the Project.

B. Functional Test: A test or tests in the presence of the OWNER to demonstrate that the installed equipment or system meets operational performance requirements including, but not limited to flow rates, noise, vibration, alignment, speed, proper electrical and mechanical connections, thrust restraint, proper rotation, and initial servicing.

C. Operation Period: The operation period begins when the facility has been successfully started up as defined under paragraph Startup Test Period and has met all Substantial Completion requirements.

D. Performance Test: A test performed in the presence of the OWNER and after any required Functional Test specified, to demonstrate and confirm that the equipment and/or system meets the specified performance requirements.

E. Significant Interruption: May include any of the following events:
1. Failure of CONTRACTOR to maintain qualified onsite startup personnel as scheduled.
2. Failure to meet specified performance for more than 2 consecutive hours.
3. Failure of any critical equipment unit, system, or subsystem that is not satisfactorily corrected within 5 hours after failure.
4. Failure of noncritical unit systems, or subsystem that is not satisfactorily corrected within 8 hours after failure.
5. As may be determined by OWNER.

F. Startup Test Period:
1. Startup of the entire facility or any portion thereof includes coordinated operation of the facilities by the CONTRACTOR, Subcontractors, OWNER, operating personnel, and manufacturer's representatives for equipment items and systems after all required Functional Tests have been completed and those Performance Tests deemed necessary for the safe operation of the entire facility have been completed.
2. Startup of the entire facility or any portion thereof shall be considered complete when, in the opinion of the OWNER, the facility or designated portion has operated in the manner intended for 3 continuous days without Significant Interruption. This period is in addition to any training, Functional Testing, or Performance Test periods specified elsewhere. A Significant Interruption will require the startup then in progress to be stopped and restarted after corrections are made.

G. System: The overall process, or a portion thereof, that performs a specific function. A system may consist of two or more subsystems as well as two or more types of equipment. Examples of Systems on this Project are:

1. Dry Location Liquid Pumps

    a. Subsystems for the dry location liquid pumps include: pump check valves, liquid level controls, VFDs, and SCADA system.

1.4 SYSTEM INTEGRATION SERVICES

A. The OWNER's System Integration Personnel will provide programming and SCADA system integration services, including configuration of equipment and devices furnished and installed by the CONTRACTOR:

1. Construction support during de-commissioning of existing Dry Location Liquid Pump controls.
2. Configuration of new instrument devices.
3. SCADA system integration of variable frequency drives (VFDs) for the new dry location liquid pumps.
4. Contractor will be responsible for startup and adjustment of pump control check valves.

1.5 SUBMITTALS

A. Prepare, deliver, and process under provisions of Section 01 33 00, SUBMITTAL PROCEDURES and Special Provisions

B. Administrative Submittals:

1. Functional and performance test plan for temporary equipment, and replacement equipment and systems. Submit at least 14 calendar days prior to start of related testing.
2. Schedule for Facility Startup to address:

    a. Completion date for pre-startup activities including schedule pump station shut downs and preparation activities, temporary equipment installation, new equipment installation completion, and pressure testing, as applicable.

    b. Verification of installation by Manufacturer/Equipment Suppliers.

    c. Startup and Functional Testing

C. Quality Control Submittals

1. CONTRACTOR's pressure testing results for new process pumping/piping systems
2. Manufacturer's Certificate of Proper Installation and Operation and Manufacturer's Certificate of Training

1.6 CONTRACTOR FACILITY STARTUP RESPONSIBILITIES

A. Complete installation of all systems and equipment identified in the Contract Documents.

B. Confirm continuity in communications cabling routed between control panels and devices.

C. Confirm voltage and proper rotation of electrically powered devices.

D. Prepare and submit testing plans and schedules.

E. Coordinate the Equipment Manufacturers' efforts to visit the site, review the installation of equipment they have supplied for the Project, and assist with functional testing.

F. Conduct pressure testing of all wetted systems affected by Project.

G. Startup and adjustment of pump check valves.

H. Correct any deficiencies identified before system start up including:

1. Power supply and/or communications connections
2. Direction of movement for all rotating equipment
3. Leaks and/or other breaches in installed system integrity

1.7 SUPPORT FOR SYSTEM INTEGRATION SERVICES

A. Upon achieving Substantial Completion, the OWNER's System Integration Personnel will:

1. Provide configuration and programming required for manual, automatic, and remote control of the new dry location liquid pumps and VFDs.

B. During the functional verification of the new dry location liquid pumps and VFDs, the CONTRACTOR is to provide the following resources to the project site:

1. On-site support from a journeyman pipefitter for a period of one 8-hour (measured as time on the project site) weekday/non-holiday calendar day, coincident with the startup and functional testing period,
2. On-site support from a journeyman electrician for a period of one 8-hour (measured as time on the project site) weekday/non-holiday calendar day, coincident with the startup and functional testing period,
3. On-site support from the CONTRACTOR's project superintendent for the startup and functional testing period.
4. Tools, equipment, and miscellaneous materials for the pipefitter and electrician appropriate for undertaking troubleshooting efforts for the new controls and equipment items.

5. Support from Manufacturers representatives for pumps and pump control check valves as needed.

C. Assist with verification of proper installation, adjustment, function, performance, and operation of equipment, systems, control devices and systems, and required interfaces individually and in conjunction with process instrumentation and control system.

D. Verification of functional performance is to be the responsibility of the ENGINEER with assistance from the CONTRACTOR, and shall accomplish the following:

1. Demonstrate the operation and control of the following:

a. Electrically, pneumatically, and manually actuated valves

b. Dry location liquid pumps and VFDs operation and control features

1) Variable speed operation

2) Pump delivery rate

3) Pump vibrations and noise

4) Pump alternation feature

2. Provide operations training for the OWNER's staff as part of Manufacturer's Services.

1.8 OWNER FACILITY STARTUP RESPONSIBILITIES

A. General:

1. Review CONTRACTOR's test plan and schedule.

2. Witness each functional or performance test.

B. Startup Test Period:

1. Operate process equipment with support of CONTRACTOR.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

3.1 TESTING PREPARATION

A. General:

1. Complete installation of equipment and components identified in the Contract Documents including electrical power, instrumentation and automation communications, process piping, and instrument systems.

2. Complete and secure certificates of approval for installed components from Manufacturer's Representatives for CONTRACTOR furnished installed equipment and components.

3. Designate and furnish one or more persons to be responsible for coordinating and expediting CONTRACTOR's Facility Startup duties. The person or persons shall be present during facility startup meetings and shall be available at all times during the Facility Startup period.

4. Provide temporary valves, gauges, piping, test equipment and other materials and equipment required to conduct testing

B. Cleaning and checking: prior to starting Functional Testing:

1. Calibrate testing equipment

2. Inspect and clean equipment, devices, connected piping, and structures so they are free of foreign material.

3. Lubricate equipment in accordance with manufacturer's instructions.

4. Turn rotating equipment by hand and check motor-driven equipment for correct rotation.

5. Open and close valves by hand and operate other devices to check for binding, interference, or improper functioning.

6. Check power supply to electric-powered equipment for correct voltage.

7. Adjust clearances and torques.

8. Test for leaks.

9. Obtain completion of applicable portions of Manufacturer's Certificate of Proper Installation.

C. Ready-to-test determination will be by OWNER based at least on the following:

1. Notification by CONTRACTOR of equipment and system readiness for testing.

2. Acceptable testing plan.

3. Acceptable Operation and Maintenance Manuals.

4. Adequate completion of Work adjacent to, or interfacing with, equipment to be tested.

5. Availability of Equipment Supplier's Representative to assist in inspection and testing of installed equipment.

6. Equipment and electrical tagging complete.

7. All spare parts and special tools delivered to OWNER.

3.2 FUNCTIONAL TESTING – GENERAL

A. Begin testing at a time mutually agreed upon by the OWNER, Equipment Supplier, and CONTRACTOR.

B. Notify in writing OWNER and Representative(s) at least 10 days prior to scheduled date of Functional Tests.

C. Separate items of equipment demonstrated to function properly during subsystem testing may require no further Functional Test if documentation of subsystem testing is acceptable to OWNER.

D. Conduct Functional Tests as specified for each equipment item or system.

E. Provide the following:

1. As a condition of Substantial Completion, demonstrate all operational features and instrumentation and control functions while in manual operational mode

2. Prior to Final Completion, assist the OWNER's System Integration Service Provider in functional verification of the dry location liquid pumps process operational features, and instrumentation and control functions while in an automated operational mode

F. Performance Testing shall not commence until the equipment or system meets the specified Functional Tests.

3.3 PERFORMANCE TEST – GENERAL

A. Begin testing at a time mutually agreed upon by the OWNER and CONTRACTOR.

B. OWNER will be present during test. Notify in writing OWNER and Manufacturer's Representative(s) at least 14 days prior to scheduled date of Functional Tests.

C. Conduct performance tests as specified for each equipment item or system.

D. Unless otherwise indicated, furnish all labor, materials, and supplies for conducting the test and taking all samples and performance measurements.

E. Prepare Performance Test report summarizing test method. Include test logs, pertinent calculations, and certification of performance.

3.4 STARTUP ACTIVITIES

A. Designate and furnish one or more persons to be responsible for coordinating and expediting CONTRACTOR's Facility Startup duties.

B. When Facility Startup has commenced, schedule remaining Work so as not to interfere with or delay the completion of Facility Startup. Support the Facility Startup activities with adequate staff to prevent delays and process upsets. This staff shall include, but not be limited to, major equipment and system Manufacturers' Representatives, electricians, instrumentation technicians, and plumbers.

C. Supply and coordinate specified manufacturer's Facility Startup services.

D. Make adjustments, repairs, and corrections necessary to complete Facility Startup.

E. After the facility is operating, complete the testing of those items of equipment, systems, and subsystems which could not be or were not adequately or successfully tested prior to startup test period.

3.5 CONTINUOUS OPERATIONS

A. OWNER will accept equipment and systems as ready for continuous operation only after successful startup is complete, and reports submitted, and manufacturers' services completed for training of OWNER’s personnel.

END OF SECTION

SECTION 02 41 13 – SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Furnish all labor, materials, and equipment necessary and incidental to the demolition, removal, and disposal of the existing pumps, piping, and structural elements.

B. Work under this section shall include but shall not be limited to

1. Protection of all existing building finishes, fences, pipes and other items related to Pump House 12.

2. Pumps and piping, miscellaneous steel and grating.

3. Protection of all adjacent private property form damage during demolition and removal activities.

1.2 RELATED SECTIONS

A. Section 05 50 00, Metal Fabrications

1.3 PROJECT CONDITIONS

A. Visit and examine the project site to assess and personally determine the extent of demolition, associated work, debris removal, disposal, and general work to be done under this section.

B. On-site burning or burial of demolition materials will not be permitted.

C. Take possession of all demolished materials, except as noted otherwise in the contract documents, and be responsible for disposing of them in accordance with applicable laws and regulation.

D. Provide continuous noise and dust abatement as required, preventing disturbance and nuisances to the public, workers, and the occupants of adjacent premises and the surrounding areas. Dampen areas affected by demolition operation as necessary to prevent dust nuisance. Provide pollution controls, dust control, erosion and sedimentation control, and other required protections in accordance with these specifications and requirements of federal, state, and local agencies having jurisdiction over the work.

1.4 SUBMITTALS

A. Make submittals in accordance with 05 50 00, Metal Fabrications.

B. Permits and notices authorizing demolition.

C. Copy of manifests showing delivery of disposed materials in accordance with the plan and permit conditions.

D. Certification that al demolished materials removed from the site have been disposed of in accordance with applicable laws and regulations.

PART 2 - PRODUCTS

2.1 PRODUCTS

A. Provide all materials and equipment required for temporary or permanent construction as required for the proper execution of the work on this section.

PART 3 - EXECUTION

3.1 EXISTING STRUCTURES AND RELATED FACILTIES

A. Perform the demolition and removal of demolition debris in accordance with the drawings and the submitted and approved demolition plans.

B. All existing and temporary fences (when no longer required to protect and secure the construction site), structures of any character not necessary to the construction of the work shall be removed by the Contractor and disposed of to the satisfaction of the Engineer.

C. Protect existing utilities, and other improvements that are not designated to be demolished. Provide and maintain all required temporary construction and facilities for the support and protection of the existing structures to remain. Restore damaged improvements not intended to be demolished.

3.2 MAINTENANCE OF TRAFFIC, ACCESS, AND UTILITES

A. Do not interfere with the use of or access to adjacent right-of-ways, buildings or property while work is in progress.

B. Do not close or otherwise obstruct tracks or roads without obtaining the City written permission.

C. Maintain accessibility at all times to fire hydrants within the construction area.

D. Ensure that utilities serving adjacent buildings remain in service.

3.3 PROTECTION OF EXISTING PROPERTY AND IMPROVEMENTS

A. Where existing piping and equipment shown on the Drawings is to remain, protect and maintain such piping and equipment from damaged.

B. Protect form damage buildings and equipment that are adjacent to demolition work.

3.4 DEMOLITION ACTIVITES

A. Where abandoned pipes and conduits are permitted to be left in place, cap or plug pipes and conduits.

END OF SECTION

SECTION 05 50 00 – METAL FABRICATIONS

PART 1 - GENERAL

1.1 THE REQUIREMENT

A. Work included:

1. Stainless Ladder and Cages
2. Stainless Steel Platform
3. Stainless Guardrail Pipes.
4. Fiberglass Grating.

B. Products furnished, but not installed, under this Section:

1. Anchor bolts, threaded rod, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast or built into concrete.
2. Stainless Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

C. Related work:

1. MASS Division 30 – Portland Concrete
2. Mass Division 80 Art. 4.2 Cast-in-Place Concrete for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts, and other items cast into concrete.
3. Section 09 90 00 – Painting and Coating

1.2 REFERENCES

A. ASTM International - Metal Stairs Manual 5th Edition

1.3 SUBMITTALS

A. Dimensional prints: shall be submitted for approval prior to fabrication.

1.4 PRODUCT DELIVERY STORAGE AND HANDLING

A. Deliver materials to the jobsite in good condition and properly protected against damage to finished surfaces.

B. Store material in a location and manner to avoid damage. Do not stack components. Lay out components on firm foundation material such that bending cannot occur.

C. Store metal components in a clean dry location, away from uncured concrete, cement, or masonry products, acids, oxidizers, rain water, or any other chemical or substance that might damage the material or finish.

D. Plan work and storage locations to keep on-site handling to a minimum.

E. Exercise particular care to avoid damage to material finishes or unprotected surfaces when handling.

1.5 JOB CONDITIONS

A. Verify that other trades with related work are complete.

B. Mounting surfaces shall be straight and secure; substrates shall be of proper width.

C. Refer to the construction documents, shop drawings, and manufacturer's installation instructions.

D. Observe all appropriate OSHA safety guidelines for this work.

1.6 WARRANTY/GUARANTEE

A. Manufacturer's standard warranty: Materials shall be free of defects in material and workmanship for a period of (25) twenty five years from the date of purchase. Should a part fail to function in normal use within this period, manufacturer shall furnish a new part at no charge. Electrical motors, special finishes, and other special equipment (if applicable) shall be warranted separately by the manufacturers of those products.

B. Manufacturer's Quality System: Registered to ISO 9001:2008 Quality Standards including in-house engineering for product design activities.

1.7 ACTION SUBMITTALS

A. Product Data: For each type of grating, accessory, and product indicated.

B. Shop Drawings: Show fabrication and installation details for metal fabrications.

1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

C. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.8 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified professional engineer.

B. Welding certificates.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

1.9 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.6, "Structural Welding Code - Stainless Steel."

1.10 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.2 FASTENERS

A. General: Unless otherwise indicated, provide Type 316/316L stainless-steel fasteners for project use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

1. Provide stainless-steel fasteners for fastening aluminum.
2. Provide stainless-steel fasteners for fastening stainless steel.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.

1. Provide galvanized steel bolts for fastening wood to steel.

C. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 325, Type 3; with hex nuts, ASTM A 563, Grade C3; and, where indicated, flat washers.

D. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593; with hex nuts, ASTM F 594; and, where indicated, flat washers.

E. Threaded Rod: ASTM F 593, Grade 316, of dimensions indicated; with nuts, ASTM A 316; and, where indicated, flat washers.

F. Eyebolts: ASTM A 489.

G. Machine Screws: ASME B18.6.3.

H. Lag Screws: ASME B18.2.1.

I. Wood Screws: Flat head, ASME B18.6.1.

J. Plain Washers: Round, ASME B18.22.1.

K. Lock Washers: Helical, spring type, ASME B18.21.1.

L. Anchors, General: Anchors capable of sustaining, without failure, four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

M. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.

2.3 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.

4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.4 STAINLESS STEEL LADDER RUNG

A. Fabricate and install ladder rung assemblies in accordance with the requirements set forth in this subsection. Provide brackets and fittings for installation.

1. Manufacturer:

a. Alabama Metal Industries Corporation (AMICO), 3245 Fayette Ave P.O. Box 3928 Birmingham. AL 35208; Phone: (800) 366-2642.

b. Substitutions will not be considered.

2. Performance requirements:

a. Meet all requirements of OSHA Standard 1926.1053 Fixed Ladder Rungs.

b. Ladder Rungs shall be designed for a concentrated vertical load of 250 pounds in the middle of the rung.

c. Provide letter of Design Certification signed and sealed by qualified professional engineer licensed by the State of Alaska and including:

1) Name and location of project.

2) Order Number.

3) Name of manufacturer.

4) Name of contractor.

5) Governing building code and year of edition.

6) Design Loads.

3. Dimensions
   a. Dimensions shall be as shown on the Drawings.
4. Materials
   a. Ladder Rung: Stainless Steel (316L) for primary structural components.
5. Finish: Natural finish
6. Fabrication:
   a. Stainless steel welding in accordance with ANSI/AWS D1.6 GMAW process performed by experienced operators.
   b. All exposed surfaces smooth and free of sharp or jagged edges.

2.5 STAINLESS STEEL GUARDRAILS

1. Performance requirements:
   a. Guardrails shall be designed to resist a concentrated load of 200 pounds applied at any point and in any direction at the top of the rail.
2. Materials
   a. Guardrail:
      1) Designed for platform application.
      2) 1-1/4-inch pipe SCHD 40

2.5 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.6 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
   1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

B. Shop prime iron and steel items not indicated to be stainless steel or galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
   1. Shop prime with universal shop primer unless indicated.

PART 3 - EXECUTION

3.1 PREPARATIONS

A. Coordination: Coordinate start and installation of metal fabrications with performance and construction requirements, and in accordance with approved shop drawings or dimensional prints. Fabricate and shop-assemble to greatest extent possible.

B. Verification: Verify that dimensions and angles are correct, and that substrate is in proper condition for metal fabrications installation. Do not proceed with installation until all necessary corrections have been made.

3.2 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.3 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Anchor supports for operable partitions securely to and rigidly brace from building structure.

C. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.

1. Where grout space under bearing plates is indicated for items supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" Article.

3.4 INSTALLING BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.

1. Use nonshrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture; use nonshrink, nonmetallic grout in exposed locations unless otherwise indicated.

2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.5 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 09 90 00 Painting and Coating.

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780.

D. Finish exposed surfaces to remove tool and die marks, stretch lines, welds and burrs, and to blend into surrounding surface for stainless steel guardrails.

3.6 CLEAN-UP

A. Leave work areas clean and free of debris.

END OF SECTION 05 50 00

SECTION 09 90 00 – PAINTING AND COATING

PART 1 - GENERAL

1.1 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American National Standards Institute (ANSI):
    a. Standard Colors for Color Identification and Coding.
    b. A13.1, Scheme for the Identification of Piping Systems.
2. American Water Works Association (AWWA):
    a. C210, Liquid-Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines.
    b. C213, Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines.
    c. C214, Tape Coating Systems for the Exterior of Steel Water Pipelines.
3. NSF International (NSF): 61 Drinking Water System Components - Health Effects.
4. NACE International: RP0188, Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates.
5. Occupational Safety and Health Act (OSHA).
6. The Society for Protective Coatings (SSPC):
    a. QP1, Standard Procedure for Evaluating Qualifications of Painting Contractors (Field Application to Complex Structures).
    b. QP2, Standard Procedure for Evaluating the Qualifications of Painting Contractors to Remove Hazardous Paint.
    c. SP 1, Solvent Cleaning.
    d. SP 2, Hand Tool Cleaning.
    e. SP 3, Power Tool Cleaning.
    f. SP 5, Joint Surface Preparation Standard White Metal Blast Cleaning.
    g. SP 6, Joint Surface Preparation Standard Commercial Blast Cleaning.
    h. SP 7, Joint Surface Preparation Standard Brush-Off Blast Cleaning.
    i. SP 10, Joint Surface Preparation Standard Near-White Blast Cleaning.
    j. SP 11, Power Tool Cleaning to Bare Metal.
    k. SP 12, Surface Preparation and Cleaning of Steel and Other Hard Materials by High- and Ultrahigh-Pressure Water Jetting Prior to Recoating.
    l. SP 13, Surface Preparation of Concrete.
    m. PA 1, Shop, Field, and Maintenance Painting.

n. PA 2, Measurement of Dry Coating Thickness with Magnetic Gages.

o. PA 3, Guide to Safety in Paint Applications.

7. Ductile Iron Pipe Research Association (DIPRA): Surface Preparation Specifications.

1.2 DEFINITIONS

A. Terms used in this section:

1. Coverage: Total minimum dry film thickness in mils or square feet per gallon.
2. FRP: Fiberglass Reinforced Plastic.
3. HCl: Hydrochloric Acid.
4. MDFT: Minimum Dry Film Thickness, mils.
5. MDFTPC: Minimum Dry Film Thickness Per Coat, mils.
6. Mil: Thousandth of an inch.
7. PSDS: Paint System Data Sheet.
8. PVC: Polyvinyl Chloride.
9. SFPG: Square Feet Per Gallon.
10. SFPGPC: Square Feet Per Gallon Per Coat.
11. SP: Surface Preparation.

1.3 SUBMITTALS

A. Shop Drawings:

1. Data Sheets:
    a. For each paint system, furnish a Paint System Data Sheet (PSDS), the manufacturer's technical data sheets, and paint colors available (where applicable) for each product used in paint system. The PSDS form is appended to the end of this section.
    b. Technical and performance information that demonstrate compliance with Specification.
    c. Submit required information on a system-by-system basis.
    d. Furnish copies of paint system submittals to the coating applicator.
    e. Indiscriminate submittal of manufacturer's literature only is not acceptable.
2. Detailed chemical and gradation analysis for each proposed abrasive material.

B. Samples:

1. Proposed Abrasive Materials: Minimum 5-pound sample for each type.
2. Reference Panel:

a. Surface Preparation:

1) Prior to start of surface preparation, furnish a 4-inch by 4-inch steel panel for each grade of sandblast specified herein, prepared to specified requirements.

2) Provide panel representative of the steel used; prevent deterioration of surface quality.

3) Upon approval by Contracting Officer's Representative, panel to be reference source for inspection.

b. Paint:

1) Unless otherwise specified, before painting work is started, prepare minimum 8- by 10-inch sample with type of paint and application specified on similar substrate to which paint is to be applied.

2) Furnish additional samples as required until colors, finishes, and textures are approved.

3) Approved samples to be the quality standard for final finishes.

C. Information Submittals:

1. Applicator's Qualification: List of references substantiating experience.

2. Coating manufacturer's Certificate of Compliance.

3. Factory Applied Coatings: Manufacturer's certification stating factory applied coating system meets or exceeds requirements specified.

4. If the manufacturer of finish coating differs from that of shop primer, provide finish coating manufacturer's written confirmation that materials are compatible.

5. Manufacturer's written instructions and special details for applying each type of paint.

6. Manufacturer's written verification that submitted material is suitable for the intended use.

D. Health and Environmental

1. Health and environmental consultant-- lead paint abatement plan

1.4 QUALITY ASSURANCE

A. Qualifications:

1. Applicator: Minimum 5 years' experience in application of specified products.

B. Regulatory Requirements:

1. Meet federal, state, and local requirements limiting the emission of volatile organic compounds.

2. Perform surface preparation and painting in accordance with recommendations of the following:

a. Paint manufacturer's instructions.

b. SSPC PA 3, Guide to Safety in Paint Applications.

c. Federal, state, and local agencies having jurisdiction.

1.5 WARRANTY

A. Inspection of all surfaces to be coated must be done by the manufacturer's representative to insure proper preparation prior to application. All thinners, fillers, primers and finish coatings shall be from the same manufacturer to support a product warranty. Products other than those submitted shall be accompanied by a letter stating its fitness for use and compatibility. Manufacturer shall provide a 5 year warranty on the coating materials.

B. Contractor shall provide a 2 year warranty on the coating materials and workmanship.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Shipping:

1. Where precoated items are to be shipped to the site, protect coating from damage. Batten coated items to prevent abrasion.

2. Shop painted surfaces shall be protected during shipment and handling by suitable provisions including padding, blocking, and use of canvas or nylon slings.

B. Storage:

1. Store products in a protected area that is heated or cooled to maintain temperatures within the range recommended by paint manufacturer.

2. Primed surfaces shall not be exposed to weather for more than 2 months before being top coated, or less time if recommended by coating manufacturer.

1.7 PROJECT CONDITIONS

A. Environmental Requirements:

1. Do not apply paint in temperatures or moisture conditions outside of manufacturer's recommended maximum or minimum allowable.

2. Do not perform final abrasive blast cleaning whenever relative humidity exceeds 85 percent, or whenever surface temperature is less than 5 degrees F above dew point of ambient air.

3. Perform tests as required to verify existing paint types and compatibility with new painting.

B. Lead Paint and Primers

1. Paint on piping, valves and other mechanical equipment and some concrete has been tested and found to be lead-based paint. See Section XVIII, Hazardous

Materials Survey Report, for test results. Other paints may also contain lead, and it is the contractor's responsibility to maintain jobsite health and safety and to verify that paints are lead free.

2. The contractor shall be responsible for the health and safety of his workers, his subcontractors and owner personnel and owner contractors regarding lead exposure from existing paint and primers.
3. The contractor shall employ the services of a reputable and recognized health and environmental services firm to determine if any paint removal process will be hazardous to worker's health
4. The health and environmental consultant shall develop a formal abatement plan that the contractor shall follow for the removal of any and all paint which contains lead in levels above the maximum allowable exposure.
5. In general, dust generated from sanding and/or sandblasting are the transportation mechanisms which carry lead contaminated paint dust to the inhalation system of a human being. The contractor shall avoid the generation of dust from paint products containing lead.
6. Discovery of additional lead contaminated paint shall be reported immediately to the engineer.
7. The contractor shall be responsible for all costs related to the discovery, testing removal and disposal of lead paint and residue from existing painted surfaces.
8. The contractor shall not use any paint or primer containing lead as an additive to the paint.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Nationally recognized manufacturers of paints and protective coatings who are regularly engaged in the production of such materials for essentially identical service conditions.

B. Minimum of 5 years' verifiable experience in manufacture of specified product.

2.2 ABRASIVE MATERIALS

A. Select abrasive type and size to produce surface profile that meets coating manufacturer's recommendations for specific primer and coating system to be applied.

2.3 PAINT MATERIALS

A. General:

1. Manufacturer's highest quality products suitable for intended service.

2. Compatibility: Only compatible materials from a single manufacturer shall be used in the Work. Particular attention shall be directed to compatibility of primers and finish coats.

3. Thinners, Cleaners, Driers, and Other Additives: As recommended by coating manufacturer.

B. Products:

Products	Definition
Acrylic Latex	Single-component, finish as required
Acrylic Latex (Flat)	Flat latex
Acrylic Sealer	Clear acrylic
Alkyd (Semigloss)	Semigloss alkyd
Alkyd Enamel	Optimum quality, gloss or semigloss finish as required, medium long oil
Alkyd Wood Primer	Flat alkyd
Bituminous Paint	Single-component, coal-tar pitch based
Block Filler	Primer-sealer designed for rough masonry surfaces,100% acrylic emulsion
Coal-Tar Epoxy	Amine, polyamide, or phenolic epoxy type 70% volume solids minimum, suitable for immersion service
Elastomeric Polyurethane	100% solids, plural component, spray applied, high build, elastomeric polyurethane coating, suitable for the intended service
Epoxy Primer – Ferrous Metal	Anticorrosive, converted epoxy primer containing rust-inhibitive pigments
Epoxy Primer – Other	Epoxy primer, high-build, as recommended by coating manufacturer for specific galvanized metal, copper, or nonferrous metal alloy to be coated
High Build Epoxy	Polyamide or polyamidoamine epoxy, minimum 69% volume solids, capability of 4 to 8 MDFT per coat
Inorganic Zinc Primer	Solvent or water based, having 85% metallic zinc content in the dry film; follow manufacturer's recommendation for topcoating
Latex Primer Sealer	Waterborne vinyl acrylic primer/sealer for interior gypsum board and plaster. Capable of providing uniform seal and suitable for use with specified finish coats

100% Solids Epoxy	Internal coatings subject to submersion in industrial & domestic sewage, resistant to low pH (1.5) and bonds well with concrete, 150 mil thick Carboline "Semstone 140" 100% solids, high performance epoxy liner system with primer, or approved equal
Polyurethane Enamel	Two-component, aliphatic or acrylic based polyurethane; high gloss finish
Rust-Inhibitive Primer	Single-package steel primers with anticorrosive pigment loading

2.4 MIXING

A. Multiple-Component Coatings:

1. Prepare using each component as packaged by paint manufacturer.
2. No partial batches will be permitted.
3. Do not use multiple-component coatings that have been mixed beyond their pot life.
4. Furnish small quantity kits for touchup painting and for painting other small areas.
5. Mix only components specified and furnished by paint manufacturer.
6. Do not intermix additional components for reasons of color or otherwise, even within the same generic type of coating.

B. Colors: Formulate paints with colorants free of lead, lead compounds, or other materials that might be affected by presence of hydrogen sulfide or other gas likely to be present at site.

2.5 NON-SKID SURFACES

A. Where non-skid surfaces are specified, use coarse quartz sand broadcast evenly over first coat while tacky.

PART 3 - EXECUTION

3.1 GENERAL

A. Provide Contracting Officer's Representative minimum 7 days' advance notice to start of field surface preparation work and coating application work.

B. Perform the Work only in presence of Contracting Officer's Representative, unless Contracting Officer's Representative grants prior approval to perform the Work in Contracting Officer's Representative absence.

C. Schedule inspection with Contracting Officer's Representative in advance for cleaned surfaces and all coats prior to succeeding coat.

3.2 EXAMINATION

A. Factory Finished Items:

1. Schedule inspection with Contracting Officer's Representative before repairing damaged factory-finished items delivered to site.

2. Repair abraded or otherwise damaged areas on factory-finished items as recommended by coating manufacturer. Carefully blend repaired areas into original finish. If required to match colors, provide full finish coat in field.

B. Surface Preparation Verification: Inspect and provide substrate surfaces prepared in accordance with these Specifications and printed directions and recommendations of paint manufacturer whose product is to be applied. The more stringent requirements shall apply.

3.3 PROTECTION OF ITEMS NOT TO BE PAINTED

A. Remove, mask, or otherwise protect hardware, lighting fixtures, switch plates, aluminum surfaces, machined surfaces, couplings, shafts, bearings, nameplates on machinery, and other surfaces not specified elsewhere to be painted.

B. Provide drop cloths to prevent paint materials from falling on or marring adjacent surfaces.

C. Protect working parts of mechanical and electrical equipment from damage during surface preparation and painting process.

D. Mask openings in motors to prevent paint and other materials from entering.

E. Protect all surfaces adjacent to, or downwind of Work area from overspray.

3.4 SURFACE PREPARATION

A. Field Abrasive Blasting:

1. Perform blasting for items and equipment where specified and as required to restore damaged surfaces previously shop or field blasted and primed or coated.

2. Refer to coating systems for degree of abrasive blasting required.

3. Where the specified degree of surface preparation differs from manufacturer's recommendations, the more stringent shall apply.

B. Metal Surface Preparation:

1. Where indicated, meet requirements of SSPC Specifications summarized below:

    a. SP1, Solvent Cleaning: Removal of all visible oil, grease, soil, drawing and cutting compounds, and other soluble contaminants by cleaning with solvent.

    b. SP2, Hand Tool Cleaning: Removal of loose rust, loose mill scale, loose paint, and other loose detrimental foreign matter, using non-power hand tools.

    c. SP3, Power Tool Cleaning: Removal of loose rust, loose mill scale, loose paint, and other loose detrimental foreign matter, using power-assisted hand tools.

    d. SP5, White metal Blast Cleaning: Removal of all visible oil, grease, dust, dirt, mill scale, rust, coatings, oxides, corrosion products, and other foreign matter by blast cleaning.

    e. SP6, Commercial Blast Cleaning: Removal of all visible oil, grease, dust, dirt, mill scale, rust, coatings, oxides, corrosion products, and other foreign matter, except for random staining limited to no more than 33 percent of each unit area of surface which may consist of light shadows, slight streaks, or minor discolorations caused by stains of rust, stains of mill scale, or stains of previously applied coatings.

    f. SP7, Brush-Off Blast Cleaning: Removal of all visible rust, oil, grease, soil, dust, loose mill scale, loose rust, and loose coatings. Tightly adherent mill scale, rust, and coating may remain on surface.

    g. SP10, Near-White Blast Cleaning: Removal of all visible oil, grease, dust, dirt, mill scale, rust, coatings, oxides, corrosion products, and other foreign matter, except for random staining limited to no more than 5 percent of each unit area of surface which may consist of light shadows, slight streaks, or minor discolorations caused by stains of rust, stains of mill scale, or stains of previously applied coatings.

    h. SP11, Power Tool Cleaning to Bare Metal: Removal of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxide, corrosion products, and other foreign matter using power-assisted hand tools capable of producing suitable surface profile. Slight residues of rust and paint may be left in lower portion of pits if original surface is pitted.

    i. SP12, Surface Preparation and Cleaning of Steel and Other Hard Materials by High- and Ultrahigh-Pressure Water Jetting Prior to Recoating: Surface preparation using high- and ultrahigh-pressure water jetting to achieve specified surface cleanliness condition. Surface cleanliness conditions are defined in SSPC SP12 and are designated WJ-1 through WJ-4 for visual surface preparation definitions, and SC-1 through SC-3 for nonvisual surface preparation definitions.

2. The words “solvent cleaning,” “hand tool cleaning,” “wire brushing,” and “blast cleaning,” or similar words of equal intent in these Specifications or in paint manufacturer's specification refer to the applicable SSPC Specification.

3. Where OSHA or EPA regulations preclude standard abrasive blast cleaning, wet or vacu-blast methods may be required. Coating manufacturers' recommendations for wet blast additives and first coat application shall apply.
4. Ductile Iron Pipe Supplied with Asphaltic Varnish Finish: Remove asphaltic varnish finish prior to performing specified surface preparation.
5. Hand tool clean areas that cannot be cleaned by power tool cleaning.
6. Round or chamfer sharp edges and grind smooth burrs, jagged edges, and surface defects.
7. Welds and Adjacent Areas:
    a. Prepare such that there is:
        1) No undercutting or reverse ridges on weld bead.
        2) No weld spatter on or adjacent to weld or any area to be painted.
        3) No sharp peaks or ridges along weld bead.
    b. Grind embedded pieces of electrode or wire flush with adjacent surface of weld bead.
8. Preblast Cleaning Requirements:
    a. Remove oil, grease, welding fluxes, and other surface contaminants prior to blast cleaning.
    b. Cleaning Methods: Steam, open flame, hot water, or cold water with appropriate detergent additives followed with clean water rinsing.
    c. Clean small isolated areas as above or solvent clean with suitable solvent and clean cloth.
9. Blast Cleaning Requirements:
    a. Type of Equipment and Speed of Travel: Design to obtain specified degree of cleanliness. Minimum surface preparation is as specified herein and takes precedence over coating manufacturer's recommendations.
    b. Select type and size of abrasive to produce surface profile that meets coating manufacturer's recommendations for particular primer to be used.
    c. Use only dry blast cleaning methods.
    d. Do not reuse abrasive, except for designed recyclable systems.
    e. Meet applicable federal, state, and local air pollution and environmental control regulations for blast cleaning, confined space entry (if required), and disposition of spent aggregate and debris.
10. Post-Blast Cleaning and Other Cleaning Requirements:
    a. Clean surfaces of dust and residual particles from cleaning operations by dry (no oil or water vapor) air blast cleaning or other method prior to painting. Vacuum clean enclosed areas and other areas where dust settling is a problem and wipe with a tack cloth.
    b. Paint surfaces the same day they are blasted. Reblast surfaces that have started to rust before they are painted.

C. Galvanized Metal, Copper, and Nonferrous Metal Alloy Surface Preparation:

1. Remove soil, cement spatter, and other surface dirt with appropriate hand or power tools.
2. Remove oil and grease by wiping or scrubbing surface with suitable solvent, rag, and brush. Use clean solvent and clean rag for final wiping to avoid contaminating surface.
3. Obtain and follow coating manufacturer's recommendations for additional preparation that may be required.

D. Concrete Surface Preparation:

1. Do not begin until 30 days after concrete has been placed.
2. Remove grease, oil, dirt, salts or other chemicals, loose materials, or other foreign matter by solvent, detergent, or other suitable cleaning methods.
3. Brush-off blast clean to remove loose concrete and laitance, and provide a tooth for binding. Upon approval by Contracting Officer's Representative, surface may be cleaned by acid etching method. Approval is subject to producing desired profile equivalent to No. 80 grit flint sandpaper. Acid etching of vertical or overhead surfaces shall not be allowed.
4. Secure coating manufacturer's recommendations for additional preparation
5. Apply suitable filler if required, for excessive bug holes exposed after blasting.
6. Unless otherwise required for proper adhesion, ensure surfaces are dry prior to painting.

E. Masonry Surface Preparation:

1. Complete and cure masonry construction for 14 days or more before starting surface preparation work.
2. Remove oil, grease, dirt, salts or other chemicals, loose materials, or other foreign matter by solvent, detergent washing, or other suitable cleaning methods.
3. Clean masonry surfaces of mortar and grout spillage and other surface deposits using one of the following:
    a. Nonmetallic fiber brushes and commercial muriatic acid followed by rinsing with clean water.
    b. Brush-off blasting.
    c. Water blasting.
4. Do not damage masonry mortar joints or adjacent surfaces.
5. Leave surfaces clean and, unless otherwise required for proper adhesion, dry prior to painting.
6. Masonry Surfaces to be Painted: Uniform texture and free of surface imperfections that would impair intended finished appearance.
7. Masonry surfaces to be clear coated. Free of discolorations and uniform in texture after cleaning.

F. Existing Painted Surfaces to be Repainted Surface Preparation:

1. Detergent wash and freshwater rinse.
2. Clean loose, abraded, or damaged coatings to substrate by Hand or Power Tool, SP 2 or SP 3.
3. Feather surrounding intact coating.
4. Apply one spot coat of specified primer to bare areas, overlapping prepared existing coating.
5. Apply one full finish coat of specified primer to entire surface.
6. If an aged, plural-component material is to be topcoated, contact coating manufacturer for additional surface preparation requirements.
7. For ductile iron pipe with asphaltic varnish finish not specified to be abrasive blasted, apply coat of tar stop prior to application of cosmetic finish coat.
8. Application of Cosmetic Coat:
    a. It is assumed that existing coatings have oxidized sufficiently to prevent lifting or peeling when overcoated with paints specified.
    b. Check compatibility by application to a small area prior to starting painting.
    c. If lifting or other problems occur, request disposition from Contracting Officer's Representative.
9. Perform blasting as required to restore damaged surfaces. Materials, equipment, procedures shall meet requirements of Steel Structures Painting Council.

3.5 SURFACE CLEANING

A. Brush-off Blast Cleaning:

1. Equipment, procedure, and degree of cleaning shall meet requirements of SSPC SP 7, Brush-off Blast Cleaning.
2. Abrasive: Either wet or dry blasting sand, grit, or nutshell.
3. Select various surface preparation parameters, such as size and hardness of abrasive, nozzle size, air pressure, and nozzle distance from surface such that surface is cleaned without pitting, chipping, or other damage.
4. Verify parameter selection by blast cleaning a trial area that will not be exposed to view.
5. Contracting Officer's Representative will approve acceptable trial blast cleaned area and will use area as a representative sample of surface preparation.
6. Repair or replace surface damaged by blast cleaning.

B. Acid Etching:

1. After precleaning, spread the following solution by brush or plastic sprinkling can: 1 part commercial muriatic acid reduced by 2 parts water by volume. Adding acid to water in these proportions gives an approximate 10 percent solution of HCl.

2. Application:
    a. Application Rate: Approximately 2 gallons per 100 square feet.
    b. Work acid solution into surface by hard-bristled brushes or brooms until complete wetting and coverage is obtained.
    c. Acid will react vigorously for a few minutes, during which time brushing shall be continued.
    d. After bubbling subsides (10 minutes), hose down remaining slurry with high pressure clean water.
    e. Rinse immediately to avoid formation on the surface of salts that are difficult to remove.
    f. Thoroughly rinse to remove any residual acid surface condition that may impair adhesion.
3. Ensure surface is completely dry before application of coating.
4. Apply acid etching to obtain a “grit sandpaper” surface profile. If not, repeat treatment.

C. Solvent Cleaning:
1. Consists of removal of foreign matter such as oil, grease, soil, drawing and cutting compounds, and any other surface contaminants by using solvents, emulsions, cleaning compounds, steam cleaning, or similar materials and methods which involve a solvent or cleaning action.
2. Meets requirements of SSPC SP 1.

3.6 APPLICATION

A. General:
1. The intention of these Specifications is for existing and new, interior and exterior surfaces on the interior and exterior of the pump station building; exterior of the generator building; and above-ground fuel storage tank shall be painted. This includes masonry, concrete, wood, gypsum and metal surfaces.
2. Coatings shall be applied to internal nozzle bores, unless otherwise specified.
3. For coatings subject to immersion, obtain full cure for completed system. Consult coatings manufacturer's written instructions for these requirements. Do not immerse coating until completion of curing cycle.
4. Apply coatings in accordance with these Specifications and paint manufacturers' printed recommendations and special details. The more stringent requirements shall apply. Allow sufficient time between coats to assure thorough drying of previously applied paint.
5. Vacuum clean surfaces free of loose particles. Use tack cloth just prior to applying next coat.
6. Coat units or surfaces to be bolted together or joined closely to structures or to one another prior to assembly or installation.

7. On pipelines, terminate coatings along pipe runs to 1 inch inside pipe penetrations.
8. Keep paint materials sealed when not in use.
9. Where more than one coat is applied within a given system, alternate colors to provide a visual reference showing required number of coats have been applied.

B. Galvanized Metal, Copper, and Nonferrous Metal Alloys:

1. Concealed galvanized, copper, and nonferrous metal alloy surfaces (behind building panels or walls) do not require painting, unless specifically indicated herein.
2. Prepare surface and apply primer in accordance with System No. 5 specification.
3. Apply intermediate and finish coats of the coating system appropriate for the exposure.

C. Porous Surfaces, Such As Concrete and Masonry:

1. Filler/Surfacer: Use coating manufacturer's recommended product to fill air holes, bug holes, and other surface voids or defects.
2. Prime Coat: May be thinned to provide maximum penetration and adhesion.
    a. Type and Amount of Thinning: Determined by paint manufacturer and dependent on surface density and type of coating.
3. Surface Specified to Receive Water Base Coating: Damp, but free of running water, just prior to application of coating.

D. Film Thickness and Coverage:

1. Number of Coats:
    a. Minimum required without regard to coating thickness.
    b. Additional coats may be required to obtain minimum required paint thickness, depending on method of application, differences in manufacturers' products, and atmospheric conditions.
2. Application Thickness:
    a. Do not exceed coating manufacturer’s recommendations.
    b. Measure using a wet film thickness gauge to ensure proper coating thickness during application.
3. Film Thickness Measurements and Electrical Inspection of Coated Surfaces:
    a. Perform with properly calibrated instruments.
    b. Recoat and repair as necessary for compliance with Specification.
    c. All coats are subject to inspection by Contracting Officer’s Representative and coating manufacturer's representative.
4. Visually inspect concrete, masonry, nonferrous metal, plastic, and wood surfaces to ensure proper and complete coverage has been attained.

5. Give particular attention to edges, angles, flanges, and other similar areas, where insufficient film thicknesses are likely to be present, and ensure proper millage in these areas.

6. Apply additional coats as required to achieve complete hiding of underlying coats. Hiding shall be so complete that additional coats would not increase the hiding.

3.7 PROTECTIVE COATINGS SYSTEMS

A. System No. 1 Submerged Metal:

Surface Prep.	Paint Material	Min. Coats, Cover
SP5, White Metal Blast Cleaning	Prime in accordance with manufacturer's recommendations	
	Coal-Tar Epoxy -OR- High Build Epoxy	2 coats, 16 MDFT 2 coats, 16 MDFT

B. System No. 2 Previously Coated Process Piping:

Surface Prep.	Paint Material	Min. Coats, Cover
SP3, Power Tool Cleaning	Prime in accordance with manufacturer's recommendations	
	High Build Epoxy -OR- Coal-Tar Epoxy (Under grate in Pump room)	2 coats, 16 MDFT 2 coats, 16 MDFT

C. System No 3 Concrete Surfaces, Not Submerged

Surface Prep.	Paint Material	Min. Coats, Cover
SP3, Power Tool Cleaning	Prime in accordance with manufacturer's recommendations	
	High Build Epoxy	2 coats, 16 MDFT

D. System No. 4 Exposed Metal – Mildly Corrosive:

Surface Prep.	Paint Material	Min. Coats, Cover
SP3, Power Tool Cleaning	Epoxy Primer – Ferrous Metal	1 coats, 2.5 MDFT

	Polyurethane Enamel	1 coats, 3 MDFT

E. System No. 10 Galvanized Metal, Copper, and Nonferrous Metal Alloy Conditioning:

Surface Prep.	Paint Material	Min. Coats, Cover
In accordance with paragraph Galvanized Metal, Copper and Nonferrous Metal Alloy Surface Preparation	Epoxy Primer – Other	As recommended by the coating manufacturer Remaining coats as required for exposure
	Alkyd Enamel	2 coats, 4 MDFT

F. System No. 11 Interior Concrete Submerged or Intermittently Submerged:

Surface Prep.	Paint Material	Min. Coats, Cover
SP3, Power Tool Cleaning, solvent cleaning and substrate drying and environmental control, temperature and humidity, as necessary to meet manufactures recommendations	Prime in accordance with manufacturers recommendations	
	100% Solids Epoxy	5 coats, 150 mils

G. System No. 12 Exterior Wood / Existing Coating

Surface Prep.	Paint Material	Min. Coats, Cover
Remove surface irregularities by scraping or sanding to produce uniform substrate for coating application	Exterior high hiding- all-purpose latex primer	1 coat or as required
	Exterior Acrylic latex, semigloss enamel	2 coats, 10 MDFT

H. System No. 13 Interior Wood and Dry-wall / Existing Coatings

Surface Prep.	Paint Material	Min. Coats, Cover
Drywall--Repair cracks, holes and other surface defects with joint compound to produce surface flush with adjacent surfaces Existing Coatings--Remove surface irregularities by scraping or sanding to produce uniform substrate for coating application	Interior Multipurpose latex primer	1 coat, or as required
	Interior Acrylic Semi-gloss latex	2 coats, 10 MDFT

3.8 COLORS

A. Provide colors to match existing painted surfaces of the same type, for approval by the engineer. Interior and exterior wall colors may be changed.

B. Proprietary identification of colors is for identification only. Selected manufacturer may supply matches.

C. Equipment Colors:

1. Equipment includes the machinery or vessel itself plus the structural supports and fasteners and attached electrical conduits.
2. Paint equipment and piping one color as selected.
3. Paint non-submerged portions of equipment the same color as the piping it serves, except as itemized below:
    a. Dangerous Parts of Equipment and Machinery: OSHA Orange.
    b. Fire Protection Equipment and Apparatus: OSHA Red.
    c. Physical hazards in normal operating area and energy lockout devices, including, but not limited to, electrical disconnects for equipment and equipment isolation valves in air and liquid lines under pressure: OSHA Yellow.

3.9 FIELD QUALITY CONTROL

A. Independent Testing Inspector

1. Provide an independent NACE Level 3 certified coatings inspector.
2. Inspector shall provide a report certifying proper surface preparation and coating application as well as certification of successful holiday testing results.

B. Testing Equipment:

1. Provide magnetic type dry film thickness gauge to test coating thickness specified in mils, as manufactured by Nordson Corp., Anaheim, CA, Mikrotest.
2. Provide low-voltage wet sponge electrical holiday detector to test completed coating systems, 20 mils dry film thickness or less, except zinc primer, high-build elastomeric coatings, and galvanizing, for pinholes, holidays, and discontinuities, as manufactured by Tinker and Rasor, San Gabriel, CA, Model M-1.
3. Provide high-voltage spark tester to test completed coating systems in excess of 20 mils dry film thickness. Unit to be as recommended by coating manufacturer.

C. Testing:

1. Thickness and Continuity Testing:
    a. Measure coating thickness specified in mils with a magnetic type, dry film thickness gauge, in accordance with SSPC PA 2. Check minimum of 8 hours after application of coating.
    b. Holiday detect coatings 20 mils thick or less, except zinc primer and galvanizing, with low voltage wet sponge electrical holiday detector in accordance with NACE RP0188.
    c. Holiday detect coatings in excess of 20 mils dry with high voltage spark tester as recommended by coating manufacturer and in accordance with NACE RP0188.
    d. After repaired and recoated areas have dried sufficiently, retest each repaired area. Final tests may also be conducted by Contracting Officer's Representative.

D. Inspection: Leave staging and lighting in place until Contracting Officer's Representative has inspected surface or coating. Replace staging removed prior to approval by Contracting Officer's Representative. Provide additional staging and lighting as requested by Contracting Officer's Representative.

E. Unsatisfactory Application:

1. If item has an improper finish color or insufficient film thickness, clean surface and topcoat with specified paint material to obtain specified color and coverage. Obtain specific surface preparation information from coating manufacturer.
2. Evidence of runs, bridges, shiners, laps, or other imperfections is cause for rejection.
3. Repair defects in accordance with written recommendations of coating manufacturer.

F. Damaged Coatings, Pinholes, and Holidays:

1. Feather edges and repair in accordance with recommendations of paint manufacturer.

2. Hand or power sand visible areas of chipped, peeled, or abraded paint, and feather the edges. Follow with primer and finish coat. Depending on extent of repair and appearance, a finish sanding and topcoat may be required.

3. Apply finish coats, including touchup and damage-repair coats in a manner that will present a uniform texture and color-matched appearance.

3.10 CLEANUP

A. Place cloths and waste that might constitute a fire hazard in closed metal containers or destroy at end of each day.

B. Upon completion of the Work, remove staging, scaffolding, and containers from site or destroy in a legal manner.

C. Remove Paint spots, oil, or stains upon adjacent surfaces and floors and leave entire job clean.

3.11 APPLICATION SCHEDULE

A. Surfaces Not Requiring Painting: Unless otherwise stated or shown below or in other sections, the following areas or items will not require painting or coating:

1. Reinforcing steel.

2. Nonferrous and corrosion-resistant ferrous alloys such as aluminum, chromium plate, atmospherically exposed weathering steel, and stainless steel, except where:

a. Required for electrical insulation between dissimilar metals.

b. Aluminum and stainless steel are embedded in concrete or masonry, or aluminum is in contact with concrete or masonry.

c. Color coding of equipment and piping is required.

3. Nonmetallic materials such as glass, decorative stone, and porcelain, except as required for architectural painting or color coding.

4. Prefinished electrical and architectural items such as motor control centers, switchboards, switchgear, panelboards, transformers, disconnect switches, galvanized conduit, building louvers, and wall panels.

5. Items specified to be galvanized after fabrication, unless specified elsewhere or subject to immersion.

6. Insulated piping and insulated piping with jacket will require prime coat only, except as required for architectural painting or color coding.

7. Fiberglass reinforced plastic (FRP) surfaces with an integral ultra-violet resistant colored gel coat do not require painting, provided the color is as selected.

8. Pump motor housings above volute/motor joint, hoisting equipment, exposed threads of piping joints.

B. Unless otherwise shown or specified, paint surfaces in accordance with the following application schedule. In the event of discrepancies or omissions in the following, request clarification from Contracting Officer's Representative before starting work in question.

C. System No. 1 Submerged Metal: Use on the following items or areas:

1. Interior surfaces of new steel piping.

D. System No. 2 Previously Coated Process Piping: Use on the following items or areas:

1. Exterior surfaces of ferrous piping within pump.
2. Steel Pipe supports for Force Mains A and B above elevation 7.62

E. System No 3 Concrete Surfaces: use on the following items or areas:

1. All concrete surfaces within pump room located below elevation 7.62, including pump room ceiling and sump below elevation 9.25. Horizontal walking surfaces (floors and stairs) shall incorporate non-skid grit within the coating.
2. Concrete pipe supports for Force Mains A and B above elevation 7.62.

F. System No. 4 Exposed Metal – Mildly Corrosive: Use on the following items or areas:

1. All previously coated exposed metal surfaces, located inside or outside of structures and exposed to weather, including but not limited to: pump shaft safety enclosures, sluice gate actuator stands, and above-ground fuel storage tank.

G. System No. 5 Galvanized Metal, Copper, and Nonferrous Metal Alloy Conditioning: Use on the following items or areas:

1. Copper piping to hydraulic actuators where coating is damaged by reconnection to actuators.
2. After application of System No. 5, apply finish coats as required for exposure.

H. System No. 11, Interior Concrete Submerged and Intermittently Submerged: Use on the following items or areas:

1. Interior of influent manhole and interior of wet wells no's 1 and 2.
2. After thorough cleaning and surface preparation, dry and condition concrete in accordance to manufactures recommendations to receive coating. Strict adherence to temperature both substrate and environmental and humidity limitations will be required.

I. System No. 12, Exterior Wood / Existing Coating: Use on the following items or areas:

1. Exterior of pump station building and generator building.

J. System No. 13, Interior Wood and Dry-Wall / Existing Coatings: Use on the following items or areas:

1. Interior of pump station building; walls and ceilings.

3.12 SUPPLEMENTS

A. The supplements listed below, following “END OF SECTION,” are a part of this Specification:

1. Paint System Data Sheet (PSDS).

END OF SECTION

PAINT SYSTEM DATA SHEET

Complete and attach manufacturer's Technical Data Sheet to this PSDS for each coating system.

Paint System Number (from Spec.):		
Paint System Title (from Spec.):		
Coating Supplier:		
Representative:		
Surface Preparation:		
Paint Material (Generic)	Product Name/Number	Min. Coats, Coverage

Provide manufacturer's recommendations for the following parameters at temperature (F) /relative humidity:

Temperature/RH	50/50	70/30	90/25
Induction Time			
Pot Life			
Shelf Life			
Drying Time			
Curing Time			
Min. Recoat Time			
Max. Recoat Time			

Provide manufacturer's recommendations for the following:

Mixing Ratio: _____

Maximum Permissible Thinning: _____

Ambient Temperature Limitations: min.: _____ max.: _____

Surface Temperature Limitations: min.: _____ max.: _____

Surface Profile Requirements: min.: _____ max.: _____

SECTION 22 11 19 – STAINLESS STEEL PIPING AND TUBING SYSTEMS

PART 1 - GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall furnish and install all exposed piping and tubing as shown and specified, complete, including stainless steel pipe and tubing, fittings, valves, bolts, supports, insulating connections, manifolds, and such other specialties as required for a complete and operable piping system in accordance with the requirements of the Contract Documents.

B. All items shall be manufactured from stainless steel.

1.2 CONTRACTOR SUBMITTALS

A. For the materials and equipment items supplied under the provisions of this Section, the CONTRACTOR shall submit copies of the manufacturer's product specifications and performance details according to the requirements of MASS Section 10.05 Article 5.6. `

PART 2 - PRODUCTS

2.1 STAINLESS STEEL PIPE

A. All mounting nipples for gauges, instruments and other appurtenances shall be stainless steel, Type 316 Schedule 80 threaded pipe conforming to ASTM A 312 with stainless steel threaded fittings.

2.2 STAINLESS STEEL TUBING

A. All instrument sensing lines shall be stainless steel tubing. Stainless steel tubing shall be seamless 316L stainless steel tubing meeting ASTM A213, ASME SA-213 specifications with a minimum wall thickness of 0.049 inches. All fittings shall be compression, guaranteed gas bubble-tight as Manufactured by **Swagelok**, or equal.

2.3 ISOLATION VALVES

A. All instrument isolation valves shall be ball valves, 316 stainless steel, **Swagelok 40 Series**, or equal.

2.4 THREE VALVE INSTRUMENT MANIFOLDS

A. All instrument manifolds shall be 316 stainless steel, **Swagelok V Series 3-Valve Manifold** or equal.

2.5 PIPE SUPPORTS

A. Pipe supports, hangers, anchors, and guides shall be compatible with the pipe or tubing materials.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Supports: Pipe and tubing systems shall be securely anchored and supported to prevent undue deflection or vibration in accordance with the applicable codes and standards. Provide all hangers, supports, guides, anchors, bolts, and mounting accessories as required for the installation. Maximum spacing between supports shall be 4 feet for all tubing.

B. Piping: Individual tubes shall run parallel and near the surfaces from which they are supported. Bends shall be formed to uniform radii with the proper tool without deforming or thinning the walls of the tubing. Ends of tubing shall be square-cut and cleaned before being inserted in the fittings. Bulkhead fittings shall be provided at all panels requiring pipe or tubing entries.

C. Isolation Valves: All instrument mounting nipples and sensing lines shall be provided with isolation valves at the pipe tap.

D. Instrument Manifolds: All pressure transmitters shall be provided with instrument manifolds for testing and calibration. All manifolds shall be independently supported. Differential pressure elements shall have three valve manifolds.

E. Piping Taps: All piping taps shall be made at the horizontal centerline of the pipe to minimize the introduction of air into the sensing lines. Instruments shall be mounted vertically. All taps shall include an isolation valve.

F. Air Traps: All tubing shall be installed to avoid air traps and allow air to be bled off. In general, tubing shall be routed to provide a continuous rise from the tap to the instrument.

G. Tubing Tags: All tubing lines shall be identified at the tap with a stamped, stainless steel tag wired to the tap.

END OF SECTION 22 11 19

SECTION 25 14 05 – LOCAL CONTROL STATIONS AND MISCELLANEOUS ELECTRICAL DEVICES

PART 1 - GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall provide complete local control stations, relays, detectors, and switches as indicated on the electrical drawings, control diagram, herein, or in other Sections of the Specifications.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Local control panels shall comply with the requirements of NEC, NEMA, and shall be built to UL-508 standards, or equal as approved by the Municipality of Anchorage Building Department.

1.3 CONTRACTOR SUBMITTALS

A. Furnish Shop Drawings in accordance with MASS Section 10.05 Article 5.6, and 26 05 00 – Electrical Work, General.
   1. Include panel schematics and layout drawings, and catalog cuts of all control equipment including enclosures, relays, pilot devices, terminations, and wire troughs.

PART 2 - PRODUCTS

2.1 GENERAL

A. The CONTRACTOR shall provide the stations to satisfy the functional requirements in the relevant mechanical equipment and Instrumentation & Control specifications and the Electrical Schematics. Each station shall be fabricated with UL-labeled components. Stations not specifically indicated as being WORK of other Sections shall be provided under this Section. All stations shall be wired under this Section.

B. The controls shall be 120-volt maximum, preferably 24 VDC. Where the electrical power supply is 240-volt, single-phase or 480-volt, 3-phase, the station shall be provided with a fused control power transformer. Control conductors shall be provided in accordance with Section 26 05 00 – Electrical Work, General.

C. Each station shall be provided with identified terminal strips for the connection of external conductors. The CONTRACTOR shall provide sufficient terminal blocks to connect 25 percent additional conductors for future use. Termination points shall be identified in accordance with Shop Drawings. The stations shall be the source of power for all 24 VDC/120 VAC solenoid valves interconnected with the stations. All equipment associated with the stations shall be ready for service after connection of conductors to equipment, controls, and stations.

D. Wiring to door-mounted devices shall be extra flexible and anchored to doors using wire anchors cemented in place. Exposed terminals of door-mounted devices shall be guarded to prevent accidental personnel contact with energized terminals.

E. Enclosures
   1. In indoor rooms, enclosures shall be NEMA 12 steel enclosures painted with ANSI 61 exterior and white interior.
   2. In outdoor areas and underground locations, enclosures shall be NEMA 4X stainless steel (prior to modifications) with brushed finish. Where possible, penetrations shall be made in such a manner as to maintain the NEMA 4X rating. If this is not possible, the penetrations shall be made in such a manner as to minimize entry of foreign materials into the enclosure.
   3. Through the door disconnects are not permitted.
   4. Enclosures shall be freestanding, pedestal-mounted, or equipment skid-mounted, as indicated. Internal control components shall be mounted on a removable mounting pan. Mounting pan shall be finished white.
   5. Enclosures shall have non-locking handles.

F. Disconnect Switches
   1. Heavy duty, non-fusible, single throw.
   2. Horsepower rated.
   3. UL listed.
   4. Padlockable in "Off" position and door interlock without having the operator mounted on the door.
   5. Enclosure per area classification in Section 26 05 00 – Electrical Work, General.
   6. 600-volt, 3-phase, 3-pole.
   7. Auxiliary control contact as applicable and as indicated.
   8. As manufactured by **G.E., Cutler-Hammer,** or **Square D**.

G. Identification of panel-mounted devices, conductors, and electrical components shall be in accordance with Section 26 05 00 – Electrical Work, General.

H. Panel-mounted devices shall be mounted a minimum of 3 feet above finished floor elevation.

I. Combination Motor Starters: Provide NEMA combination motor starters not furnished in a new MCC, **Allen-Bradley Bulletin 513**, or equal.
   1. Provide circuit breakers. Fuses are not acceptable.
   2. Provide overload relay. Overload relay shall be electronic, **Allen-Bradley E300**, or equal, or thermal overload, as noted on the drawings.
   3. Provide terminal strips for field terminations.
   4. Provide green run lights.
   5. “Through the door” type disconnects are not permitted.
   6. Assembly shall be Listed as “Self Protected” under UL 508 Type F
   7. Provide status contact as required by control wiring diagrams.
   8. Provide the following combination starters:

Facility	Drawing
N/A	

Note: Sump pump combination starters are listed separately in Article 2.6 of this Section.

2.2 STATION COMPONENTS

A. Pushbuttons, selector switches, and pilot lights shall be the heavy-duty, oil-tight type, sized to 30 mm. Miniature style devices are not acceptable. Devices shall be as manufactured by **Square D, G.E., Cutler-Hammer**, or equal. Switches shall be UL listed for use in existing motor starters, MCCs, or LCPs, as required.
   1. Lens colors shall be green for "run," "open," or "on;" red for "stopped," "closed," or "off;" and amber for alarm.
   2. Pilot lights shall be LED type.

B. Relays shall be 1, 2, or 3 PDT, as required, with 10-amp contacts, plug-in type utilizing rectangular blades and provided with sockets for screw-type termination and hold-down clips or DIN rail mounted. Relays shall be as manufactured by **Square D, Potter Brumfield**, or equal.

C. Magnetic starters shall be:
   1. NEMA rated. IEC or dual NEMA/IEC rated type are not acceptable.
   2. FVNR type unless indicated otherwise.
   3. Combination starters with magnetic only instantaneous trip circuit breakers such as **Cutler-Hammer "MCP," G.E., "Mag-Break,"** or equal.
   4. Control transformers shall be provided with primary and secondary fuses, 120-volt maximum control voltage.

D. Terminal strips shall be provided for all panels and shall be the flanged fork or ring lug type suitable for No. 12 AWG stranded wire minimum, or shall be DIN rail-mounted terminals, **Phoenix model KDKS**, or equal. Provide 25 percent spare terminals in each panel.

E. Time delay relays shall be combination on delay and off delay (selectable) with adjustable timing ranges. Provide socket with screw terminal connections and retaining strap. Time delay relays shall be Square D JCK70, or equal.

2.3 FACTORY TESTING

A. Each LCS shall be factory-assembled and tested for sequence of operation prior to delivery.

2.4 MISCELLANEOUS DEVICES

A. Intrusion Detection Switches:
   1. Industrial limit switch and lever arm, **Allen-Bradley 802T-HP switch with 802MC-W2B lever arm**, or equal.
   2. Provide the following intrusion detection switches:

Tag No.	Location
ZS-100E	Control Room OH Door

B. Smoke Detectors: Smoke detectors are to be **GE Interlogix ESL 500N Series, Model 541NCRXT**, or equal. Provide the following devices:

Tag No.	Location
N/A	

C. Flood Detectors: Flood detection is to be accomplished utilizing single-level liquid level sensors that employ hermetically sealed magnetic reed switch technology. The detector is to have a float made from Burna-N that rides up and down a brass stem. The 'normally closed' switching contact is to be rated at 24 VDC, 0.5 A. Flood detectors are to be **Madison M Series model M4300**, or equal. Provide the following flood detectors:

Tag No.	Location
N/A	

D. Valve Limit Switches: Valve off-seat limit switches shall be single-pole double-throw, **Cla-Val X105LCW**, or equal, compatible with the type of valve. Provide a complete assembly, including rising stem, bushing, mounting bracket, adjustable locking collar, and mechanical modifications required for installation. Provide the following devices:

Tag No.	Location
N/A	

E. High Wet Well Float Switch: The float switch shall be a simple level switch that provides a contact on high level. The float body shall be high-density polypropylene and the cable shall be flexible PVC, rated 120 VAC and use in corrosive environments at a temperature range of -20 degrees F to 100 degrees F. The contact shall be a single Form C-type mercury or mercury-free switch. The float switch shall include a Kevlar Cable grip and 20 meters of cable. The switch shall be **Flygt Model ENM-10**, or equal.

F. Pump Protection Relays: The pump protection relay shall monitor the pump for high temperature and leakage. The relay for Flygt pumps shall plug into an 11-pin socket, operate on 24V AC or DC, and shall provide a single 2-pole contact for high temperature and a single 2-pole contact for leakage. The relay for ABS pumps shall be a UL 508 listed control panel with ABS solid state seal minder relay, motor protection relay, and seal in relay. The relay shall be UL-listed for use with the type of existing pumps shown on the following table:

Pump Station	Pumps
12	1, 2, 3, 4

2.5 SOLENOID VALVE ASSEMBLIES

A. Solenoid valves shall be designed for not less than 0 to 116 psi differential pressure. Enclosures shall be NEMA 4X. All coil ratings shall be 24 VDC, class H insulation, continuous duty. Solenoid valves shall be **ASCO 8320P172**.

B. Actuating valves for potable water service shall have brass or stainless steel body with screwed ends, stainless steel trim and spring, Teflon or other resilient seals with material best suited for the temperature and fluid handled. Valve bodies shall be **Cla-Val 100-01-203H**.

C. Each device shall consist of an assembly of a solenoid valve as specified in Paragraph A above, and valve body as specified in Paragraph B above. Connect the solenoid valve to the valve body with a 1/8" x 1-1/2" brass nipple. Provide the following devices:

Tag No.	Location	Description

D. Spares: Provide two (2) spare solenoid valves, only as specified in Paragraph A above.

2.6 SUMP PUMP CONTROLLER

A. The sump pump controller shall be located in a NEMA combination motor starter panel as shown on the Drawings. Combination motor starter panels shall be in accordance with paragraph 2.1.I above. Electrical and control wiring is shown on the Sump Pump Control sheet for each facility where required. The sump pump controller shall be a complete and functional system, suitable for operating the specified sump pump, and shall be equipped with appropriate circuit breakers, magnetic starter, electronic overload (A-B E300 Plus or equal), hand/off/auto selector switch, and "green" pump running indicator LED lamp.

B. Existing sump pumps and associated controls shall be connected to the new power/controls for a functional system.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Stations shall be installed in accordance with Section 26 05 00 – Electrical Work, General, and in accordance with the manufacturer's recommendations.

B. Stations shall be protected at the Site from loss, damage, and the effects of weather. Stations shall be stored in an indoor, dry location. Heating shall be provided in areas subject to corrosion and humidity.

C. Station interiors and exteriors shall be cleaned, and coatings shall be touched up to match original finish upon completion of the WORK.

D. Conduit, conductors, and terminations shall be installed in accordance with Section 26 05 00 – Electrical Work, General.

E. Solenoid valves shall be securely supported and connected to existing copper tubing hydraulic control valve harnesses or pre-lube lines.
   1. Solenoid valves shall be independently supported using stainless steel hardware and shall not rely on copper tubing for support. The CONTRACTOR shall submit support details to the ENGINEER for approval prior to installation.

3.2 FIELD TESTING

A. Each station shall be tested again for functional operation in the field after the connection of external conductors and prior to equipment startup.

B. Deficient stations shall be corrected, to the ENGINEER’S satisfaction, at the CONTRACTOR’S expense.

END OF SECTION 25 14 05

SECTION 25 36 16 – MONITORING TRANSDUCERS

PART 1 - GENERAL (NOT USED)

PART 2 - PRODUCTS

2.1 GENERAL

A. Signal Output: Outputs shall be current regulated 4-20 mA DC capable of driving 0 to 600 ohms.

B. All instruments shall be FM-approved, or equal.

2.2 ELECTRONIC POWER MONITOR

A. The electronic power monitor shall measure 3-phase power, power factor, current, voltage, voltage unbalance, frequency, demand, and Volt-Amp-reactive power. The meter shall have a two-element connection, a two-and-one-half-element connection, and a three-element connection. The meter shall provide an EtherNet output and a door-mounted display module. Power supply shall be 24 VDC. The monitor package shall include (3) split ring CTs for single-phase service and (4) split ring CTs for three-phase services. The meter shall be an **Allen-Bradley Bulletin 1426-M5E**, or equal.

B. Provide the following power monitors:

Tag No.	Location
PM	MCC

2.3 DC SYSTEM VOLTAGE TRANSDUCER

A. The DC system voltage transducer shall provide a 4-20 mA output, fully isolated from input, proportional to a 0-50 VDC input. Supply voltage shall be 24 VDC. The transducer shall provide accuracy of 0.5% of span with a 250 ms response time.

B. Manufacturer: **CR Magnetics CR5320-50**, or equal.

C. Install DC system voltage transducers as shown on the panel wiring diagrams.

PART 3 - EXECUTION

3.1 GENERAL

A. All monitoring transducers shall be handled, installed, calibrated, loop-tested, precommissioned, and performance tested in accordance with the Manufacturer's

installation instructions and Section 40 90 00 – Process Control and Instrumentation Systems.

3.2 ELECTRONIC POWER MONITOR INSTALLATION

A. Installation of electronic power monitors shall include a shorting switch as recommended by the Manufacturer.

B. Power monitor display modules shall be door-mounted at eye level.

END OF SECTION 25 36 16

SECTION 26 01 26 – ELECTRICAL TESTS

PART 1 - GENERAL

1.1 THE REQUIREMENT

A. This Section specifies the WORK necessary to test, commission, and demonstrate that the electrical WORK satisfies the criteria of these Specifications and functions as required by the Contract Documents.

B. The requirements of Section 26 05 00 – Electrical Work, General, apply to the WORK of this Section.

1.2 TESTING

A. The following test requirements supplement test and acceptance criteria that may be stated elsewhere.
   1. Lighting: Switching, including remote control, if indicated. Circuitry is in accordance with panel schedules.
   2. Power Instrumentation: Demonstrate that power monitor, power monitoring, current monitoring, and voltage monitoring is functional.
   3. Demonstrate mechanical and/or electrical interlocking by attempting to subvert the intended sequence.
   4. Activate ground fault tripping by operating test features provided with ground current protective systems and by injecting a known and reasonable current in the ground current sensor circuit. In general, ground fault tripping should occur at a ground current equivalent to 20 percent of phase current. Current injection is not required of circuit 400 amps or less.
   5. Cable Testing: power circuits shall be tested for insulation resistance with a 1000-volt megohm meter. Testing shall be done after the equipment is terminated. Control and signal wires shall be tested for continuity and resistance to ground.
   6. Test Ground Fault Interrupter (GFI) receptacles and circuit breakers for proper operation by methods sanctioned by the receptacle manufacturer.
   7. A functional test and check of all electrical components is required prior to performing subsystem testing and commissioning. Compartments and equipment shall be cleaned as required by other provisions of these Specifications before commencement of functional testing. Functional testing shall comprise:
      a. Visual and physical check of cables, circuit breakers, transformers and connections associated with each item of new and modified equipment.
      b. Circuit breakers that have adjustable time or pick-up settings for ground current, instantaneous overcurrent, short-time overcurrent, or long-time overcurrent, shall be field-adjusted by a representative of the circuit breaker manufacturer. Setting shall be tabulated and proven for each circuit breaker in its installed position. Test results shall be certified by the person performing the tests and be transmitted to the ENGINEER.

8. Complete ground testing of grounding electrodes per requirements prior to operating the equipment.

B. Subsystem testing shall occur after the proper operation of alarm and status contacts has been demonstrated or otherwise accepted by the ENGINEER and after process control devices have been adjusted as accurately as possible. It is intended that the CONTRACTOR will adjust limit switches and level switches to their operating points prior to testing and will set pressure switches, flow switches, and timing relays as dictated by operating results.

C. After initial settings have been completed, each subsystem shall be operated in the manual mode and it shall be demonstrated that operation is in compliance with the Contract Documents. Once the manual mode of operation has been proven, automatic operation shall be demonstrated to verify such items as proper start and stop sequence of pumps, proper operation of valves, proper speed control, etc.

D. Motor operated valves shall be tested after having been phased and tested for correct motor rotation and after travel and torque limit switches have been adjusted by a representative of the valve manufacturer. Tests shall verify status indication, proper valve travel, and correct command control from local and remote devices.

E. Provide ground resistance tests on the main grounding bars in all control panels in the presence of the ENGINEER and submit results.

F. Subsystems shall be defined as individual and groups of pumps, conveyor systems, chemical feeders, air conditioning units, ventilation fans, air compressors, etc.

G. General: Carry out tests indicated herein for individual items of materials and equipment in other Sections.

H. Megger each complete phase wire, cable, termination, and submersible pump winding to ground.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 26 01 26

SECTION 26 05 00 – ELECTRICAL WORK, GENERAL

PART 1 - GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall provide electrical work, complete and operable, in accordance with the Contract Documents.

B. The provisions of this Section apply to all sections in Division 26, except as indicated otherwise.

C. The WORK of this Section is required for operation of electrically-driven equipment provided under specifications in other Divisions. The CONTRACTOR's attention is directed to the requirement for proper coordination of the WORK of this Section with the WORK of equipment specifications, and the WORK of instrumentation sections.

D. The CONTRACTOR shall develop a work plan clearly indicating how temporary power and controls/SCADA will be provided/maintained to this Facility within the prescribed work and outage parameters of this section.

E. Concrete, excavation, backfill, and steel reinforcement required for encasement, installation, or construction of the WORK of the various sections of Division 26 is included as a part of the WORK under the respective sections, including duct banks, manholes, handholes, equipment housekeeping pads, and light pole bases.

1.2 REFERENCE STANDARDS

A. The WORK of this Section and all sections in Division 26 shall comply with the following, as applicable:

NEC (NFPA 70)	National Electrical Code, latest adopted edition
NETA	International Electrical Testing Association
NEMA 250	Enclosures for Electrical Equipment (1000 Volts Maximum)

Anchorage Electrical Code amendments to the NEC.

B. Electrical equipment shall be listed by and shall bear the label of Underwriters' Laboratories, Inc. (UL), or another suitable third-party listing agency recognized by the State of Alaska Mechanical Inspections Division.

C. Installation of electrical equipment and materials shall comply with OSHA Safety and Health Standards, state building standards, and applicable local codes and regulations.

D. Where the requirements of the specifications conflict with UL, NEMA, NFPA, or other applicable standards, the more stringent requirements shall govern.

1.3 SIGNAGE

A. Local Disconnect Switches:
   1. Each local disconnect switch for motors and equipment shall be legibly marked to indicate its purpose, unless the purpose is indicated by the location and arrangement.

B. Warning Signs:
   1. 600 volts nominal, or less. – Entrances to rooms and other guarded locations that contain live parts shall be marked with conspicuous signs prohibiting entry by unqualified persons.

C. Isolating Switches: Isolating switches not interlocked with an approved circuit interrupting device shall be provided with a sign warning against opening them under load.

1.4 PUBLIC UTILITIES REQUIREMENTS

A. The CONTRACTOR shall contact the serving utility and verify compliance with requirements before construction. The CONTRACTOR shall coordinate schedules and payments for work by all utilities.

B. Electrical service shall be as indicated and be as required by the serving utility.

C. The CONTRACTOR shall verify and provide all service conduits, fittings, grounding devices, and all service wires not provided by the serving utility.

D. The CONTRACTOR shall verify with the utility the exact location of each service point and type of service, and shall pay all charges levied by the serving utilities as part of the WORK.

1.5 PERMITS AND INSPECTION

A. All electrical permits shall be obtained and inspection fees shall be paid by the CONTRACTOR.

B. The CONTRACTOR shall pay all connection and turn-on service charges required by the utility company.

1.6 CONTRACTOR SUBMITTALS

A. Furnish submittals in accordance with MASS Section 10.05 Article 5.6.

B. Shop Drawings: Include the following:
   1. Complete material lists stating manufacturer and brand name of each item or class of material.
   2. Shop Drawings for all grounding WORK not specifically indicated.

3. Front, side, rear elevations, and top views with dimensional data.
4. Location of conduit entrances and access plates.
5. Component data.
6. Connection diagrams, terminal numbers, internal wiring diagrams, conductor size, and cable numbers.
7. Method of anchoring, seismic requirements, weight.
8. Types of materials and finish.
9. Nameplates.
10. Temperature limitations, as applicable.
11. Voltage requirement, phase, and current, as applicable.
12. Front and rear access requirements.
13. Test reports.
14. Grounding requirements.
15. Catalog cuts of applicable pages of bulletins or brochures for mass produced, non-custom manufactured material. Catalog data sheets shall be stamped to indicate the project name, applicable Section and paragraph, model number, and options. This information shall be marked in spaces designated for such data in the ENGINEER's stamp.

C. Shop Drawings shall be custom prepared. Drawings or data indicating "optional" or "as required" equipment are not acceptable. Options not proposed shall be crossed out or deleted from Shop Drawings.

D. Materials and Equipment Schedules: The CONTRACTOR shall deliver to the ENGINEER within 30 days of the commencement date in the Notice to Proceed, a complete list of all materials, equipment, apparatus, and fixtures proposed for use. The list shall include type, sizes, names of manufacturers, catalog numbers, and other such information required to identify the items.

E. Owner's Manuals: Complete information in accordance with MASS Section 10.04, Article 4.20 Operating and Maintenance Manuals.

F. Record Drawings: The CONTRACTOR shall show invert and top elevations and routing of all duct banks and concealed below-grade electrical installations. Record Drawings shall be prepared, be available to the ENGINEER, and be submitted according to MASS Section 10.05 Article 5.6.

G. Equipment Summary Sheets: The CONTRACTOR shall provide Electrical Equipment Summary Form 1302 CM 1207 for all electrical devices, panels, motor starters, and miscellaneous equipment. The data shall be provided in electronic format, **Microsoft Excel**, or approved equal.

1.7 AREA DESIGNATIONS

A. General:
1. Raceway system enclosures shall comply with Section 26 05 33 – Electrical Raceway Systems.

2. Electrical WORK specifically indicated in sections within any of the Specifications shall comply with those requirements.
3. Electrical WORK in above ground indoor facilities shall be NEMA 12.
4. Electrical WORK in below ground facilities and outdoors shall be NEMA 4X.
5. Installations in hazardous locations shall conform strictly to the requirements of the Class, Group, and Division indicated.

B. Material Requirements:
1. NEMA 4X enclosures shall be stainless steel.
2. NEMA 12 enclosures shall be steel, coated with ANSI 61 grey paint.

1.8 TESTS

A. The CONTRACTOR shall be responsible for factory and field tests required by specifications in Division 26 and by the ENGINEER or other authorities having jurisdiction. The CONTRACTOR shall furnish necessary testing equipment and pay costs of tests, including all replacement parts and labor, due to damage resulting from damaged equipment or from testing and correction of faulty installation.

B. Where test reports are indicated, proof of design test reports for mass-produced equipment shall be submitted with the Shop Drawings, and factory performance test reports for custom-manufactured equipment shall be submitted and be approved prior to shipment. Field test reports shall be submitted for review prior to Substantial Completion.

C. Equipment or material which fails a test shall be removed and replaced.

1.9 ELECTRICAL OUTAGE AND WORK PLAN

A. The CONTRACTOR shall develop an ‘Outage and Work Plan’. The plan shall clearly indicate how temporary service, power and controls/SCADA will be provided/maintained to this Facility within the prescribed work and outage parameters.

B. The intent is for the CONTRACTOR to clearly define how they anticipate removing and installing the new power service, switchgear and control panel RTU in the existing locations while maintaining a critical, functioning facility in continuous operation based on the outage parameters. The plan shall also indicated how feeder, branch and control (signal) circuits will be maintained during construction.

C. The plan shall be provided as a written (MSWord) document including but not limited to the following:
1. Description of temporary power and control systems.
2. Description of construction sequence for temporary and new installations.
3. Anticipated specific outage schedule in tabular format (system, outage frequency, duration of outage).

4. Site plan / control room level floor plan sheet showing anticipated locations of temporary equipment.

D. The plan shall be submitted for approval no later than 30 days prior to beginning work. Electrical and controls work shall not proceed until this plan has been submitted and approved by the ENGINEER.

1.10 DEMOLITION AND RELATED WORK

A. The CONTRACTOR shall perform electrical demolition WORK as indicated on the electrical drawings and in parts of this Specification Section. The CONTRACTOR is cautioned that demolition WORK may also be indicated on non-electrical drawings. Coordinate electrical de-energization, disconnection, and removal with all trades and the overall sequence of construction.

B. Electrical requirements associated with removed equipment shall be:
   1. Remove control and signal wiring as indicated.
   2. Remove all abandoned raceways. Encased conduits shall be cut flush to the floor and be grouted.
   3. Remove remote mounted starters, disconnect switches, circuit breakers, sensors, and transmitters.
   4. Remove remote mounted status lights and switches where indicated on the electrical drawings, and blank off openings in existing panels with field-fabricated stainless steel plates. Plates shall be attached with stainless steel finish screws.
   5. Remove control panels, equipment sheds, and concrete bases and posts for panels and sheds.

C. Where new lighting and receptacles are installed, old lighting, receptacles, switches, wiring, and conduits shall be removed.

D. Raceways to be reused or extended shall be terminated in a new junction box. The junction box shall have a NEMA rating in accordance with the area in which it is located and shall be sized as required.

E. Materials and equipment not indicated to be removed and returned to the OWNER shall, upon removal, become the CONTRACTOR's property and shall be disposed of off-site.

F. Material and equipment indicated to be relocated or reused shall be removed and relocated, and reinstalled with care to prevent damage thereto.

G. Materials indicated to be returned to the OWNER shall be placed in boxes with the contents clearly marked and be stored at a location determined by the ENGINEER.

H. Where MCCs or panelboards are indicated to have circuits removed and reconnected, the MCC shall have a new engraved phenolic nameplate worded as indicated, and the panelboard schedule shall be modified to indicate the revised circuits. Pencil or magic marker markings directly on the MCC or panelboard breaker

are not permitted. Similarly, associated wire and cable labeling shall be updated or provided new as required.

1.11 CONSTRUCTION SEQUENCING

A. Continuance of facility operation during demolition and the installation process is critical at this facility. Therefore, the CONTRACTOR shall carefully examine all work to be done in, on, or adjacent to existing equipment. Work shall be scheduled, subject to the OWNER's approval under the submitted 'Outage and Work Plan', to minimize required process or equipment shutdown time.

B. All switching, safety tagging, etc., required for process or equipment shutdown or to isolate existing equipment shall be performed by the CONTRACTOR. In no case shall the CONTRACTOR begin any work in, on, or adjacent to existing equipment without written authorization by the AWWU plant supervisor and the ENGINEER. The CONTRACTOR shall remove the lock within 4 hours upon request of AWWU, in an emergency, and if the equipment is operable.

C. The CONTRACTOR shall make all modifications or alterations to existing electrical facilities required to successfully install and integrate the new electrical equipment as indicated on the electrical drawing. Modifications to existing equipment, panels, or cabinets shall be made in a professional manner with all coatings repaired to match existing. The CONTRACTOR is responsible for ensuring all panels and equipment are UL-listed. The costs for modifications (including UL listing) to existing electrical facilities required for a complete and operating system shall be included in the CONTRACTOR's original Bid amount and no additional payment for this WORK will be authorized. Extreme caution shall be exercised by the CONTRACTOR in digging trenches in order not to damage existing underground utilities. Cost of repairs of damages caused during construction shall be the CONTRACTOR's responsibility without any additional compensation from the OWNER.

D. The CONTRACTOR shall be responsible for identifying available existing circuit breakers in lighting panels for the intended use as required by the Drawings. The CONTRACTOR shall also be responsible for field-verifying the available space in switchboards to integrate new power circuit breakers. Costs for this WORK shall be included in the CONTRACTOR's original Bid amount.

E. The CONTRACTOR shall visit the Site before submitting a Bid to better acquaint themselves with the WORK of this Contract. Lack of knowledge will not be accepted as a reason for granting extra compensation to perform the WORK.

F. Installation of New Equipment:
   1. The CONTRACTOR shall install and terminate the new switchboards, panelboards, motor control centers, motor starters, control panels, raceways, cables, and instruments in accordance with the agreed schedule. The CONTRACTOR shall provide a list, daily, of the points that are ready for service as they are connected, calibrated, and tested. The CONTRACTOR shall only connect to equipment in a safe and code compliant manner.

G. Construction Sequence:

1. The overall construction sequence in SECTION 01 11 00 – SUMMARY OF WORK shall be reviewed thoroughly and the overall schedule and requirements adhered to. This proposed sequence is specific to electrical/controls demolition and new work construction. The final sequence, developed by the CONTRACTOR, shall be written into a 'Electrical Work and Outage Plan' as required by this specification.
2. Temporary Station power:
    a. The existing standby generator can be utilized by the CONTRACTOR to support the station power during temporary outages for no more than three (3), eight (8) hour periods during construction. The OWNER can authorize additional use of the generator by specific request from the CONTRACTOR.
    b. The CONTRACTOR shall provide a portable standby generator unit of sufficient size to support two 200HP lift pumps running simultaneously. The unit shall be available and mobilized to the project site within 4 hours of an outage that cannot be supported by the existing standby generator or temporary utility connection.
3. Proposed Sequence:

    The following is a proposed sequence for electrical and controls work that will allow at least two (2) lift pumps to stay in operation, with minor outages, throughout construction. The CONTRACTOR shall further develop this basic sequence or develop their own sequence based on experience:

    a. Demolish the existing VFDs for Pumps #1 and #4 from the north end of the MCC lineup. This will create adequate space for the installation of the new service and 'Main' circuit breaker disconnect. It will also take these pumps out of service.
    b. Install the new service equipment, 'Main' circuit breaker cabinets and all wiring as specified.
    c. Pumps #2 and #3 will remain operational through the existing utility service and MCC mounted soft-starter units. This sequence will also allow the existing ATS and standby generator to remain in place and functional.
    d. Provide electrical support for the Installation of new Pumps P-1, P-4 and associated power and instrumentation/controls as specified.
    e. Provide temporary outages to install the new ATS and P-1/P-4 VFDs. Make all required pump power and control connections to new MCC/VFD equipment.
    f. It is critical the existing Control Valve (CV) pressure system be maintained through temporary service to the well pump and air compressors. The station hydraulic Knife Gate Valves (KGVs) are critical to the station's continuous proper operation throughout construction.
    g. Provide temporary connections as required to maintain other building loads for normal facility operations.
    h. Relocate the existing primary/secondary SCADA control panels to a location adjacent to the existing. Make all temporary connections required to keep Pumps P-2 and P-3 operational. Maintain the existing radio communications using these panels. Station and pumping operations shall continue to be monitored remotely from this system.

i. Install the new SCADA Control Panel ‘SCP’ in the existing location and make all required connections to the new MCC distribution equipment, VFDs and pump instrumentation to allow for Pumps P-1 and P-4’s startup and operation.
j. Energize and make functional the new service, ATS, Pump P-1/P-4 VFDs and any new MCC sections supporting building loads.
k. Establish new radio and LTE communication connections from the new SCADA Control Panel ‘SCP’ for remote monitoring of the station operation.
l. Pumps P-1 and P-4 will now maintain the station operational pumping requirements while the existing Pumps P-2 and P-3 are taken out of service and refurbished.
m. Provide electrical support for the modification to existing Pumps P-2/P-3 and all associated power and instrumentation/controls as specified.
n. Complete remaining new MCC sections supporting Pump P-2/P-3 VFDs and the remaining building loads. Finalize all new wiring and connections.
o. Fully test and commission all power and control systems as required by the specifications.
p. Demolish all remaining old switchgear equipment. Salvage and turn over existing primary and secondary control panels to the OWNER.

4. Allowable down time requirements: The CONTRACTOR shall minimize the amount of time a facility is out of service as required by SECTION 01 11 00 – SUMMARY OF WORK. The CONTRACTOR shall provide the ENGINEER with an estimate of the amount of time the facility will be out of service with the required ‘Outage and Work Plan’.
5. The ENGINEER will coordinate with the CONTRACTOR to load and commission the PLC software after the CONTRACTOR makes the wiring modifications.
6. The OWNER shall take beneficial occupancy of each facility as the WORK is signed off.
    a. Warranty: The warranty shall start from the date of final acceptance of the completed project, and shall extend for 2 years, in accordance with MASS Division 10.

PART 2 - PRODUCTS

2.1 GENERAL

A. Equipment and materials shall be new, shall be listed by UL, and shall bear the UL label where UL requirements apply. Equipment and materials shall be the products of experienced and reputable manufacturers in the industry. Similar items in the WORK shall be products of the same manufacturer. Equipment and materials shall be of industrial grade standard of construction.

B. Where a NEMA enclosure type is indicated in a non-hazardous location, the CONTRACTOR shall utilize that type of enclosure, despite the fact that certain modifications, such as cutouts for control devices, may negate the NEMA rating.

C. On devices indicated to display dates, the year shall be displayed as 4 digits.

2.2 MOUNTING HARDWARE

A. Miscellaneous Hardware:
   1. Nuts, bolts, and washers shall be stainless steel.
   2. Threaded rods for trapeze supports shall be continuous-threaded, galvanized steel, 3/8-inch diameter minimum.
   3. Strut for mounting of raceways and equipment shall be galvanized or stainless steel as required by the area classification. Where contact with concrete or dissimilar metals may cause galvanic corrosion, suitable non-metallic insulators shall be utilized to prevent such corrosion. Strut shall be as manufactured by **Unistrut, B-Line,** or equal.
   4. Anchors for attaching equipment to concrete walls, floors and ceilings shall be stainless steel expansion anchors, such as **"Rawl-Bolt," "Rawl-Stud"** or **"Lok-Bolt"** as manufactured by **Rawl**; similar by **Star**, or equal. Wood plugs shall not be permitted.

2.3 ELECTRICAL IDENTIFICATION

A. Nameplates: Nameplates shall be fabricated from black-letter, white-face laminated plastic engraving stock, **Formica type ES-1**, or equal. Each shall be fastened securely, using fasteners of brass, cadmium-plated steel, or stainless steel, screwed into inserts or tapped holes, as required. Engraved characters shall be block style, with no characters smaller than 1/8-inch in height.

B. Conductor and Equipment Identification: Conductor and equipment identification devices shall be heat-shrink plastic tubing with machine printing. Lettering shall read from left to right and shall face toward the front of the panel.

PART 3 - EXECUTION

3.1 GENERAL

A. Incidentals: The CONTRACTOR shall provide all materials and incidentals required for a complete and operable system, even if not required explicitly by the Specifications or the Drawings. Typical incidentals are terminal lugs not furnished with vendor-supplied equipment, compression connectors for cables, splices, junction and terminal boxes, and control wiring required by vendor-furnished equipment to connect with other equipment indicated in the Contract Documents.

B. Field Control of Location and Arrangement: The Drawings diagrammatically indicate the desired location and arrangement of outlets, conduit runs, equipment, and other items. Exact locations shall be determined by the CONTRACTOR in the field, based on the physical size and arrangement of equipment, finished elevations, and other obstructions. Locations on the Drawings, however, shall be followed as closely as possible.
   1. Where raceway development drawings are not shown on the plans, or "home runs," are shown, the CONTRACTOR shall route the raceways in accordance

with the indicated installation requirements. Routings shall be exposed and routed parallel and perpendicular to building walls, ceilings, and floors.

2. Conduit and equipment shall be installed in such a manner as to avoid all obstructions and to preserve headroom and keep openings and passageways clear. Lighting fixtures, switches, convenience outlets, and similar items shall be located within finished rooms as indicated. Where the Drawings do not indicate exact locations, the ENGINEER shall determine such locations. If equipment is installed without instruction and must be moved, it shall be moved without additional cost to the OWNER. Lighting fixture locations shall be adjusted slightly to avoid obstructions and to minimize shadows.
3. Wherever raceways and wiring for lighting and receptacles are not indicated, it shall be the CONTRACTOR's responsibility to provide all lighting and receptacle-related conduits and wiring as required, based on the actual installed fixture layout and the circuit designations as indicated. Wiring shall be #12 AWG minimum, and conduits shall be 3/4-inch minimum. Where circuits are combined in the same raceway, the CONTRACTOR shall derate conductor ampacities in accordance with NEC requirements.
4. Where complete raceway systems are not shown on the plans, Contractor shall submit a raceway plan for approval. Intent is to minimize number of raceway systems.

C. MOA NEC Local Amendments: The CONTRACTOR shall comply with all requirements of the MOA NEC local amendments.
   1. The CONTRACTOR shall pay particular attention to the additional grounding requirements. In general, grounding conductors are not specifically called out on the drawings but are required for every raceway.

D. Workmanship: Materials and equipment shall be installed in strict accordance with printed recommendations of the manufacturer. Installation shall be accomplished by workers skilled in the work. Installation shall be coordinated in the field with other trades to avoid interferences.

E. Protection of Equipment and Materials: The CONTRACTOR shall fully protect materials and equipment against damage from any cause. Materials and equipment, both in storage and during construction, shall be covered in such a manner that no finished surfaces will be damaged, marred, or splattered with water, foam, plaster, or paint. Moving parts shall be kept clean and dry. The CONTRACTOR shall replace or refinish damaged materials or equipment, including faceplates of panels and switchboard sections, as part of the WORK.

F. Incoming utility power equipment shall be provided in conformance with the utility's requirements. The CONTRACTOR shall coordinate new metering and Current Transformer equipment with the utility’s requirements.

G. The CONTRACTOR shall provide power wiring in raceways for the motor starters in accordance with Section 26 24 19 – Low Voltage Motor Control Center, for starters in MCC's and Section 25 14 05 – Local Control Stations and Miscellaneous Electrical Devices, for starters not in MCC's.

3.2 CORE DRILLING

A. The CONTRACTOR shall perform core drilling required for installation of raceways through concrete walls and floors. Locations of floor penetrations, as may be required, shall be based on field conditions. Verify all exact core drilling locations based on equipment actually furnished, as well as exact field placement. To the extent possible, identify the existence and locations of encased raceways and other piping in existing walls and floors with the OWNER prior to any core drilling activities. Damage to any encased conduits, wiring, and piping shall be repaired as part of the WORK.

B. All penetrations required to extend raceways through concrete walls, roofs, and floors or masonry walls shall be core drilled. New stub-up locations require housekeeping curbs; see paragraph 3.3 B. below.

C. It is the intent to utilize existing floor penetrations to the greatest extent possible. New core drilled holes shall be minimized. The CONTRACTOR shall coordinate field conditions with equipment shop drawings.

3.3 CONCRETE HOUSEKEEPING PADS

A. Concrete housekeeping pads shall be provided for indoor floor standing electrical equipment. Housekeeping pads for equipment, including future units, shall be 3-1/2 inches above surrounding finished floor or grade, and 2 inches larger in both dimensions than the equipment, unless otherwise indicated.

B. Concrete housekeeping curbs shall be provided for all conduit stub-ups in indoor locations that are not concealed by equipment enclosures. Such curbing shall be 3-1/2 inches above finished floor or grade.

3.4 EQUIPMENT ANCHORING

A. Floor supported, wall-, or ceiling-hung equipment and conductors shall be anchored in place by methods that will meet seismic requirements in the area where the project is located. Wall-mounted panels that weigh more than 500 pounds, or which are within 18 inches of the floor, shall be provided with fabricated steel support pedestals. If the supported equipment is a panel or cabinet enclosed within removable side plates, it shall match supported equipment in physical appearance and dimensions. Transformers hung from 4-inch stud walls and weighing more than 300 pounds shall have auxiliary floor supports.

B. Anchoring methods and leveling criteria in the printed recommendations of the equipment manufacturers are a part of the WORK of this Contract. Such recommendations shall be submitted as Shop Drawings under MASS Section 10.05 Article 5.6. Where manufacturer's instructions indicate the need for engineered anchorage design, such design and installation shall be provided by the CONTRACTOR as part of the work.

C. Panels, raceways, and other equipment shall be anchored and supported for Seismic requirements of MOA Building Safety.

3.5 EQUIPMENT IDENTIFICATION

A. General: Equipment and devices shall be identified as follows:
   1. Nameplates shall be provided for all panelboards, control and instrumentation panels, starters, switches, and pushbutton stations. In addition to nameplates, control devices shall be equipped with standard collar-type legend plates.
   2. Control devices within enclosures shall be identified as indicated. Identification shall be similar to the subparagraph above.
   3. Equipment names and tag numbers, where indicated on the Drawings, shall be utilized on all nameplates.
   4. The CONTRACTOR shall furnish typewritten circuit directories for panelboards; circuit directory shall accurately reflect the equipment connected to each circuit.
   5. Generator receptacles shall be identified with the incoming service voltage with 1" lettering.
   6. Generator transfer switches shall be labeled "Main" and "Generator" with ½" lettering.

3.6 CLEANING

A. Before final acceptance, the electrical WORK shall be thoroughly cleaned. Exposed parts shall be thoroughly clean of cement, plaster, and other materials. Oil and grease spots shall be removed with a non-flammable cleaning solvent. Such surfaces shall be carefully wiped and all cracks and corners cleaned out. Touch-up paint shall be applied to scratches on panels and cabinets. Electrical cabinets or enclosures shall be vacuum-cleaned.

B. CONTRACTOR shall group, coil, and tie wrap all spare cables at the bottom of the Local Control Panels. The wires shall be grouped according to the device, control panel, or MCC section they originate from. Cable groups shall be tagged according to their point of origin.

C. All debris shall be removed from the void below the panels.

3.7 CONTROL PANEL WIRING

A. The CONTRACTOR shall ensure all panels are UL-listed upon completion of the WORK.

B. See Division 40 specifications for additional requirements.

END OF SECTION 26 05 00

SECTION 26 05 19 – WIRE AND CABLES

PART 1 - GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall provide wires and cable, complete and operable, in accordance with the Contract Documents.

1.2 CONTRACTOR SUBMITTALS

A. The CONTRACTOR shall submit Shop Drawings in accordance with MASS Section 10.05 Article 5.6, and 26 05 00 – Electrical Work, General.

PART 2 - PRODUCTS

2.1 GENERAL

A. Conductors, include grounding conductors, shall be copper. Aluminum conductor wire and cable will not be permitted. Insulation shall bear the label of Underwriters' Laboratories, Inc. (UL), the manufacturer's trademark, and identify the type, voltage, and conductor size. All conductors except flexible cords and cables, fixture wires, and conductors that form an integral part of equipment, such as motors and controllers, shall conform to the requirements of Article 310 of the National Electrical Code, latest adopted edition, for current carrying capacity. Flexible cords and cables shall conform to Article 400, and fixture wires shall conform to Article 402. Wiring shall have wire markers at each end.

2.2 LOW VOLTAGE WIRE AND CABLE

A. Power and Lighting Wire
   1. Power and lighting wire shall be No. 12 copper AWG minimum size.
   2. Wire rated for 600 volts in duct or conduit for all power shall be
      a. In above grade interior locations: Class B Type THWN-2
      b. In underground and below grade installations XHHW-2
      c. Direct burial shall use XLPE outer jacketed cable.
   3. Wiring for 600 volt class power and lighting shall be as manufactured by **General Cable**, **Okonite**, or **Rome Cable**.

B. Control Wire
   1. Control wire in duct or conduit shall be the same type as power and lighting wire indicated above.
   2. Control wiring shall be No.14 19-strand copper AWG.

C. Instrumentation Cable
   1. Instrumentation cable shall be rated at 600 volts.
   2. Individual conductors shall be No. 18 AWG stranded, tinned copper. Insulation shall be color-coded polyethylene: black-red for two-conductor cable, and black-red-white for three-conductor cable.
   3. Instrumentation cables shall be composed of the individual conductors, an aluminum polyester foil shield, a No. 18 AWG stranded, tinned copper drain wire, and a PVC outer jacket with a thickness of 0.048-inches.
   4. Single pair, No. 18 AWG, twisted, shielded cable shall be **Belden Part No. 9341**, or equal.
   5. Single triad, No. 16 AWG, twisted, shielded cable shall be **Belden Part No. 1119A**, or equal.

D. Tray Cable - Tray cable is not to be used.

E. Cat 6A Cable: Cat 6A patch cable shall be 4-pair 23-gauge twisted pair rated to TIA/EIA 568-B Cat. SE and UL-listed. The CONTRACTOR shall install RJ-45 connectors as required.

F. ControlNet RG-6 Coax Cable: The ControlNet coax cable shall be type RG-6 with 75 Ohms impedance. The cable shall have 18-gauge copper conductor, a bonded aluminum foil-polyester tape to braided aluminum shield, quad shield, FEP foam insulation, a PVC jacket and a diameter of 0.25 inches. The cable shall have no more than 3db loss per 100 feet at 200 MHz. The cable shall be **Belden 1189AP**, or equal.

G. Radio Cable: Feedline cable for radios shall be a 50 ohm low loss 5/8" Heliax cable (less than 1.9 db per 100 feet) type suited for 900 MHz and rated for outdoor use with foam core. Provide type N connectors on each end of cable and provide a TNC to type N connector converter for each radio end. Cable shall be **Andrew LDF4.50A**, or equal.
   1. Coaxial radio jumper cable inside the SCADA panel shall be **Times Microwave LMR-240**, or equal.

H. DeviceNet Cable: Shall be 600-volt rated sunlight resistant, 65% braid coverage**,** UL Listed**, Allen-Bradley DeviceNet Trunk Cable, Type TC**, or equal.

I. Submersible Pump Power Cable: Submersible pumps shall be wired with submersible multi-conductor cable as required by the Drawings. The cable shall be Type W Portable Power Cable rated at 600V and 70C temperature with (2) #14 control cables. The insulation shall be EPR, and conduction shall be rope-lay-stranded copper per UL-62. The cabling shall be round with round or flat fillers as needed, with an extra-hard usage, oil resistant, thermoset, CPE jacket, per UL-1581. Cable shall be **Flygt SubCab**, or equal.

J. VFD motor branch cable: Motors circuits operated under VFD control shall be run with shielded cable. Cable shall be **Belden 295xx** (where xx= wire gauge) or VFD Manufacturer recommended equal. Twisted shielded THHN is not permitted.

2.3 CABLE TERMINATIONS

A. Compression connectors shall be **Burndy "Hi Lug", Thomas & Betts "Sta-Kon,"** or equal. Threaded connectors shall be split bolt type of high strength copper alloy. Pressure type, twist-on connectors will not be acceptable.

B. Pre-insulated fork tongue lugs shall be **Thomas & Betts, Burndy**, or equal.

C. General purpose insulating tape shall be **Scotch No. 33, Plymouth "Slip-knot,"** or equal. High temperature tape shall be polyvinyl as manufactured by **Plymouth, 3M**, or equal.

D. Labels for coding 600-volt wiring shall be heat-shrink plastic tubing type with machine print. Lettering shall read from left to right, and face the front of the panel. Field wires terminating at a Control Panel shall be labeled with the wire number shown on the LCP Panel wiring diagrams. The CONTRACTOR shall mark all as-built drawings with wire labels.

E. See Section 25 14 05 – Local Control Stations and Miscellaneous Electrical Devices, paragraph 2.4, for a list of pump types.

PART 3 - EXECUTION

3.1 GENERAL

A. The CONTRACTOR shall provide and terminate all power, control, and instrumentation conductors, except where indicated.

3.2 INSTALLATION

A. Conductors for feeders as defined in Article 100 of the NEC shall be sized to prevent a voltage drop exceeding 3 percent at the farthest outlet of power, heating, and lighting loads, or combinations of such loads, and where the maximum total voltage drop on both feeders and branch circuits to the farthest connected load does not exceed 5 percent.

B. Conductors for branch circuits as defined in Article 100 of the NEC, shall be sized to prevent a voltage drop exceeding 3 percent at the farthest connected load or combinations of such loads, and where the maximum total voltage drop on both feeders and branch circuits to the farthest connected load does not exceed 5 percent.

C. Conductors shall not be pulled into raceway until raceway has been cleared of moisture and debris.

D. Pulling tensions on raceway cables shall be within the limits recommended by the cable manufacturer. Wire pulling lubricant, where needed, shall be UL-approved.

E. The following wiring shall be run in separate raceways:

1. 24 VDC discrete signal and instrument power supply.
2. 4-20 mA analog signal.
3. All AC circuits.

F. Wire in panels, cabinets, and wireways shall be neatly grouped using nylon tie straps, and shall be fanned out to terminals.

G. Wet Well Conduit Seals: Conduit entering wet wells shall be sealed with duct seal at the end of the conduit where the conduit enters the wet well. Provide cloth rag backing and 1" of duct seal so duct seal can be removed in the future.

3.3 SPLICES AND TERMINATIONS

A. General
1. Wire taps and splices are not to be used unless the CONTRACTOR can convince the ENGINEER that they are essential and the ENGINEER gives written permission.
2. There shall be no cable splices in underground manholes or pullboxes.
3. Stranded conductors shall be terminated directly on equipment box lugs, making sure that all conductor strands are confined within the lug. Use forked-tongue lugs where equipment box lugs have not been provided.
4. Excess control and instrumentation wire shall be properly taped and terminated as spares.

B. Control Wire and Cable
1. Control conductors shall be spliced or terminated only on terminal strips in panels or vendor-furnished equipment.
2. In terminal cabinets, junction boxes, motor control centers, and control panels, control wire and spare wire shall be terminated to terminal strips.

C. Instrumentation Wire and Cable
1. Shielded instrumentation cables shall be grounded at one end only, the receiving end (i.e., in the SCADA panel) on a 4-20 mA system.

D. Power Wire and Cable
1. No 120/208-volt, 120/240-volt, and 480/277-volt branch circuit conductors may be spliced unless the CONTRACTOR can convince the ENGINEER that they are essential and the ENGINEER gives written permission.
2. Shielded power cable shall be terminated with pre-assembled stress cones in a manner approved by the cable and terminal manufacturer. The CONTRACTOR shall submit the proposed termination procedure as a Shop Drawing.

3.4 CABLE IDENTIFICATION

A. General: Wires and cables shall be identified for proper control of circuits and equipment and to reduce maintenance effort.

B. Identification Numbers: The CONTRACTOR shall assign to each control and instrumentation wire and cable a unique identification number. Numbers shall be assigned to all conductors having common terminals and shall be shown on "as built" drawings. Identification numbers shall appear within 3 inches of conductor terminals. "Control Conductor" shall be defined as any conductor used for alarm, annunciator, or signal purposes.
   1. Multiconductor cable:
      a. Assign a number that shall be attached to the cable at intermediate pull boxes and at stub-up locations beneath freestanding equipment.
      b. Cable number shall form a part of the individual wire number.
      c. Individual control conductors and instrumentation cable shall be identified at pull points as described above.
      d. The instrumentation cable numbers shall incorporate the loop numbers assigned in the Contract Documents.
   2. All 120/208-volt system feeder cables and branch circuit conductors shall be color-coded as follows:
      a. Phase A - Black
      b. Phase B - Red
      c. Phase C - Blue
      d. Neutral - White
   3. The 120/240-volt system conductors shall be color-coded as follows:
      a. Line 1 - Black
      b. Line 2 - Red
      c. Neutral - White
   4. The 480/277-volt system conductors shall be color-coded as follows:
      a. Phase A - Brown
      b. Phase B - Orange
      c. Phase C - Yellow
      d. Neutral - Gray
   5. Color-coding tape shall be used where colored insulation is not available.
      a. Branch circuit switch shall be Yellow.
      b. Insulated ground wire shall be Green.
      c. Neutral shall be Gray.
   6. Color coding and phasing shall be consistent throughout the Site, bus bars at panelboards, switchboards, and motor control centers shall be connected Phase A-B-C, top to bottom, or left to right, facing connecting lugs.
   7. General purpose AC control cables shall be Red.
   8. General purpose DC control cables shall be Blue.
   9. Spare cable shall be terminated on terminal screws and shall be identified with a unique number as well as with destination.
   10. Terminal strips shall be identified by computer-printable, cloth, self-sticking marker strips attached under the terminal strip.

3.5 TESTING

A. Cable Assembly and Testing: Cable assembly and testing shall comply with applicable requirements of ICEA Publication No. S-68-516 - Ethylene-Propylene-Rubber Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy. Factory test results shall be submitted in accordance with Section 013300 – Contractor Submittals, prior to shipment of cable. The following field tests shall be the minimum requirements:

1. Power cable rated at 600 volts shall be tested for insulation resistance between phases and from each phase to a ground using a megohmmeter rated 1000 volts.
2. Field testing shall be done after cables are installed in the raceways.
3. Field tests shall be performed by a certified test organization acceptable to the cable manufacturer. Test results shall be submitted to the ENGINEER for review and acceptance.
4. Cables failing the tests shall be replaced with a new cable or be repaired. Repair methods shall be as recommended by the cable manufacturer and shall be performed by persons certified by the industry.

B. Continuity Test: Control and instrumentation cables shall be tested for continuity, polarity, undesirable ground, and origination. Such tests shall be performed after installation and prior to placing all wires and cables in service.

END OF SECTION 26 05 19

SECTION 26 05 26 – GROUNDING

PART 1 - GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall provide the electrical grounding system, complete and operable, in accordance with the Contract Documents.

B. The requirements of Section 26 05 00 – Electrical Work, General apply to this Section.

C. Single Manufacturer: Like products shall be the end product of one manufacturer in order to achieve standardization of appearance, operation, maintenance, spare parts and manufacturer's services.

1.2 CONTRACTOR SUBMITTALS

A. Furnish submittals in accordance with MASS Section 10.05 Article 5.6 and Section 26 05 00 – Electrical Work, General.

B. Shop Drawings: Manufacturer's product information for connections, clamps, and grounding system components, showing compliance with the requirements of this Section.

PART 2 - PRODUCTS

2.1 GENERAL

A. Components of the grounding electrode system shall be manufactured in accordance with ANSI/UL 467 - Standard for Safety Grounding and Bonding Equipment, and shall conform to the applicable requirements of National Electrical Code Article 250 and local codes.

2.2 GROUNDING SYSTEM

A. Grounding loop conductors shall be bare annealed copper conductors suitable for direct burial. Conductors shall be No. 4 for 100A services, or No. 3/0, unless indicated otherwise.

B. B. Ground Rods
   1. Unless indicated otherwise, the ground rod shall be a minimum of 3/4-inch in diameter, 10 feet long, and have a uniform covering of electrolytic copper

metallically bonded to a rigid steel core. The copper to steel bond shall be corrosion resistant.
2. Conform to ANSI/UL 467.
3. Sectional type joined by threaded copper alloy couplings.

C. Buried cable-to-cable and cable-to-ground rod connections shall be made using exothermic welds by **Cadweld, Enrico Products**, or equal.

D. Exposed grounding connectors shall be of the compression type (connector to cable), made of high copper alloy, and be manufactured specifically for the particular grounding application. The connectors shall be **Burndy, O.Z. Gedney**, or equal.

E. Grounding clamps shall be used to bond each separately derived system to the grounding electrode conductors.

F. Equipment Grounding Circuit Conductors
1. These conductors shall be the same type and insulation as the load circuit conductors. The minimum size shall be as outlined in Table 250.122 of the National Electrical Code, unless indicated otherwise.
2. Metallic conduit systems shall have equipment grounding wires as well as being equipment grounding conductors themselves.

G. Ground clamps in concrete shall be rated for use with rebar and embedded in concrete.

H. Manufacturers of grounding materials shall be **Copperweld, Blackburn, Burndy**, or equal.

PART 3 - EXECUTION

3.1 GROUNDING

A. Provide a separate equipment grounding conductor, securely grounded in each raceway independent of raceway material.

B. Provide a separate grounding conductor for each motor and connect at motor box. Do not use bolts securing motor box to frame or cover for grounding connectors.

C. Size in accordance with the NEC-Article 250 and local amendments.

D. Route conductors inside raceway.

E. Provide a grounding type bushing for secondary feeder conduits which originate from the secondary section of each MCC section, switchboard, or panelboard.

F. Individually bond these raceways to the ground bus in the secondary section.

G. Provide a green insulated wire as grounding jumper from the ground screw to a box grounding screw and, for grounding type devices, to equipment grounding conductor.

H. Provide a separate grounding conductor in each individual raceway for parallel feeders.

I. Interconnect the secondary switchgear neutral bus to the ground bus in the secondary switchgear compartment only at service entrance point or after a transformer.

J. Bond cold water pipe systems and metallic building structure per NEC. Bond ALL water pipe penetrations.

K. Measure ground impedance in accordance with IEEE STD 81 after installation but before connecting the electrode to the remaining grounding system.

L. Low Voltage Grounded System (600-volt or less): A low voltage grounded system is a system where the local power supply is a transformer with the transformer secondary grounded.
   1. Grounding system connections for a premises wired system supplied by a grounded AC service shall have a grounding electrode connector connected to the grounded service conductor at each service, in accordance with the NEC.
   2. The grounded circuit conductor shall not be used for grounding non-current carrying parts of equipment, raceways, and other enclosures except where specifically listed and permitted by the NEC.

M. Embedded Ground Connections
   1. Underground and grounding connections embedded in concrete shall be UL listed compression type ground grid connectors.
   2. The connection shall be made in accordance with the manufacturer's instructions.
   3. The CONTRACTOR shall not conceal or cover any ground connections until the ENGINEER or authorized representative has established that every grounding connection conforms to the Contract Documents and has given the CONTRACTOR written confirmation.

N. Ground Rods
   1. Locations shall be as determined in the field.
   2. Rods forming an individual ground array shall be equal in length.
   3. Rod spacing shall be a minimum of the rod length.

O. Shield Grounding
   1. Shielded instrumentation cable shall have its shield grounded at one end only unless Shop Drawings indicate the shield will be grounded at both ends.
   2. The grounding point shall be at the control panel or otherwise at the receiving end of the signal carried by the cable.
   3. Termination of shield drain wire shall be on its own terminal screw.

4. Terminal screws shall be jumpered together using manufactured terminal block jumpers.
5. Connection to the ground bus shall be via a green No. 12 conductor to the main ground bus for the panel.

END OF SECTION 26 05 26

SECTION 26 05 33 – ELECTRICAL RACEWAY SYSTEMS

PART 1 - GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall provide electrical raceway systems, complete and in place, in accordance with the Contract Documents.

B. Local amendments to NEC require:
   1. The equipment grounding conductor run with or enclosing the circuit conductors shall be one or more or a combination of the following:
      a. A copper, aluminum, or copper-clad aluminum conductor.
      b. This conductor shall be solid or stranded; insulated, covered, or bare; and in the form of a wire or a bus bar of any shape.

1.2 DEFINITIONS

A. Raceway System – conduits, wireways, fittings, junction and pull boxes, supports, and labels, complete and ready for conductors.

PART 2 - PRODUCTS

2.1 GENERAL

A. Conduits, wireways, fittings, supports, labels, junction and pull boxes, and other indicated enclosures which are dedicated to the raceway system, shall comply with the requirements of this Section.

2.2 CONDUIT

A. Galvanized Rigid Steel Conduit (GRC)
   1. Rigid steel conduit shall be mild steel, hot-dip galvanized inside and out.
   2. Rigid steel conduit shall be manufactured in accordance with ANSI C80.1 - Rigid Steel Conduit, Zinc Coated, and UL-6.
   3. Manufacturers, or Equal
      a. **LTV Steel**;
      b. **Triangle**;
      c. **Wheatland Tube**.
   4. GRC shall be used in all locations except outdoor locations or NEMA-4X locations.

B. PVC-Coated Galvanized Rigid Steel Conduit (PVC-coated GRC)

1. The conduit, prior to PVC coating, shall meet the requirements for GRC conduit above.
2. A PVC coating shall be bonded to the outer surface of the galvanized conduit. The bond between the coating and the conduit surface shall be greater than the tensile strength of the coating.
3. PVC coating thickness shall be not less than 40 mils.
4. PVC-coated GRC shall be manufactured in accordance with the following standards:
    a. UL-6
    b. ANSI C80.1
    c. NEMA RN1 - PVC Externally Coated Galvanized Rigid Steel Conduit, Intermediate Metal Conduit, and where shown on the plans
5. Manufacturers, or Equal
    a. **Robroy**;
    b. **Ocal**.
6. PVC-coated GRC shall be used in all direct-bury installations, outdoor locations, below-ground facilities, NEMA 4X designated areas, and where shown on the drawings.

C. Liquidtight Flexible Conduit (LFMC)
1. Liquidtight flexible conduit (LFMC) shall be constructed of a flexible galvanized metal core with a sunlight-resistant thermoplastic outer jacket.
2. LFMC shall be manufactured in accordance with UL-360 - Steel Conduits, Liquid-Tight Flexible.
3. Manufacturers, or Equal
    a. **Anaconda, "Sealtite"**;
    b. **Electriflex, "Liquatite"**.

D. Electrical Metallic Tubing (EMT) or Intermediate conduit (IMC) will <u>not</u> be accepted.

2.3 FITTINGS AND BOXES

A. General:
1. Cast and malleable iron fittings for use with metallic conduit shall be the threaded type with 5 full threads.
2. Fittings and boxes shall have neoprene gaskets and non-magnetic stainless steel screws. All covers shall be attached by means of holes tapped into the body of the fitting. Covers for fittings attached by means of clips or clamps will not be acceptable.
3. Non-explosion-proof boxes larger than standard cast or malleable types shall be 304 stainless steel, NEMA 4X.
4. Boxes larger than standard cast or malleable types shall be 304 stainless steel, NEMA 4X.
5. In outdoor areas, raceways shall be terminated in raintight hubs as manufactured by **Myers, O.Z. Gedney**, or equal. In other than outdoor areas, sealed locknuts and bushings shall be used.

6. Fittings and boxes in hazardous locations shall be suitable for the Class and Division indicated or required by code.

B. Cast Aluminum Fittings and Boxes
   1. Cast aluminum boxes and fittings shall have less than 0.40 percent copper content.
   2. Manufacturers, or Equal
      a. **O.Z. Gedney**;
      b. **Appleton**;
      c. **Crouse-Hinds**.

C. Malleable Iron Fittings and Boxes
   1. Fittings and boxes for use with galvanized steel conduit shall be of malleable iron or gray-iron alloy with zinc plating.
   2. Manufacturers, or Equal
      a. **O.Z. Gedney**;
      b. **Crouse-Hinds**;
      c. **Appleton**.

D. PVC-Coated Fittings and Boxes
   1. Fittings and boxes for use with PVC-coated GRC shall be PVC-coated and shall be products of the same manufacturer as the conduit.
   2. Fittings used for LFMC and PVC-coated systems are to be PVC-coated.

E. Stainless Steel Boxes
   1. Stainless steel boxes shall be used with PVC-coated GRC raceway systems, in NEMA 4X designated areas, and where indicated on the Drawings.
   2. Stainless steel boxes shall be NEMA 4X, Type 304.
   3. Stainless steel shall be a minimum 14-gauge thickness, with a brushed finish.
   4. Doors shall have full-length stainless steel piano hinges. Non-hinged boxes are not acceptable.
   5. Manufacturers, or Equal
      a. **Hoffman**;
      b. **Rohn**;
      c. **Hammond**.

2.4 WIREWAYS

A. All wireways shall be painted ANSI 61 gray, galvanized 14-gauge steel with screw covers and a steel divider to separate the discrete signals from the analog signals. Wireways shall be **Hoffman**, or equal.

B. Wireway shall be NEMA 12 and used only in above ground indoor locations.

C. Wireway systems not shown on the plans shall be submitted for approval.

2.5 CABLE TRAYS

A. Cable trays are not to be used.

2.6 IDENTIFICATION TAPE

A. Continuous lengths of warning tapes shall be installed 12 inches above and parallel to all underground conduits. Tape shall be 6-inch-wide polyethylene film imprinted, “CAUTION – ELECTRIC UTILITIES BELOW.” Tape shall be as manufactured by **Brady**, or equal.

2.7 EXPLOSION-PROOF BOXES

A. Explosion-proof boxes shall be used to house control stations, switches, any arc producing device, and terminal for splicing in hazardous locations. The boxes shall be made from copper-free aluminum with stainless steel hardware, have a hinged cover, and use O-ring gaskets for watertight integrity. The boxes shall be factory painted with epoxy gray paint. Boxes 12” x 12” and larger shall have (1) 2” hole and (2) 1.5” holes, and (2) 1” holes drilled, tapped, and plugged on the bottom of the box. The boxes shall be **Appleton Electric AJBEW**, or equal.

2.8 EXPLOSION-PROOF CONDUIT FITTINGS AND UNIONS

A. Explosion-proof conduit fittings and unions shall be made from zinc electroplated malleable iron. Fittings shall include gasketed water-tight connections, be UL-listed for use in Class 1 Division 1 areas. Fittings shall be **Appleton Electric**, or equal.

PART 3 - EXECUTION

3.1 GENERAL

A. All wiring shall be run in raceway unless indicated otherwise.

B. Raceways shall be installed between equipment as indicated. Raceway systems shall be electrically and mechanically complete before conductors are installed. Bends and offsets shall be smooth and symmetrical, and shall be accomplished with tools designed for this purpose. Field bends are required on conduits up to 2”. Factory elbows may be utilized on raceways over 2”. All fittings and connections shall be made tight.

C. Separate raceway systems shall be provided for:
   1. Analog signals
   2. 24 VDC discrete signals and instrument power supply conductors
   3. 120 VAC and higher wiring

When non-loop powered instruments have only one raceway port, the CONTRACTOR may run both the analog and 24 VDC wiring in a short length of ½" LFMC to a splitter box where the wiring must then be separated into the required raceway system. The length of LFMC must be kept to the absolute minimum and must not exceed 3 feet unless written approval has been given by the ENGINEER.

D. Where raceway routings are indicated on plan views, follow those routings to the extent possible. See SECTION 26 05 00 – ELECTRICAL WORK, GENERAL Article 3.1 Paragraph B. for additional installation requirements.

E. Routings shall be adjusted to avoid obstructions. Coordinate between trades prior to installation of raceways. Lack of such coordination shall not be justification for extra compensation, and removal and re-installation to resolve conflicts shall be by the CONTRACTOR as part of the WORK.

F. Support rod attachment for ceiling-hung trapeze installations shall meet the seismic requirements.

G. Exposed raceways shall be installed parallel or perpendicular to structural beams.

H. Install expansion fittings with bonding jumpers wherever raceways cross building expansion joints.

I. Exposed raceways shall be installed at least 1/2-inch from walls or ceilings except that at locations above finished grade where damp conditions do not prevail, exposed raceways shall be installed 1/4-inch minimum from the face of walls or ceilings by the use of clamp backs or struts.

J. In underground facilities or NEMA 4X areas, all raceway penetrations in panels shall be bottom entry.

K. Wherever contact with concrete or dissimilar metals can produce galvanic corrosion of equipment, suitable insulating means shall be provided to prevent such corrosion.

L. To facilitate future expansion, boxes and fittings are to be installed when indicated on the drawings. Unused hubs are to be plugged with proprietary devices. Raceways that include future expansion provision are to be sized to accommodate any such specified wiring without exceeding the requirements of this specification.

M. The maximum allowable conduit fill for instrumentation and control wiring is given by the following table:

Conduit Diameter	No. of 14-Gauge Wires	No. of 18-Gauge TWS
3/4”	8	2
1”	16	4
1-1/4”	32	7
1-1/2”	48	10
2”	72	17

Note: No instrumentation or control wiring conduit is to be larger than 2 inches in diameter.

3.2 RACEWAYS

A. Exposed raceway systems shall be rigid galvanized steel except as follows, unless indicated otherwise:
   1. In outdoor areas, all underground vaults, and NEMA 4X areas, PVC-coated GRC shall be utilized.

B. Raceways concealed, buried, or encased in concrete, shall be PVC-coated GRC. Where conduit emerges from concrete encasement, a PVC-coated GRC elbow shall be utilized for transition from the concrete. Conduit shall emerge from the concrete perpendicular to the surface whenever possible.

C. Exposed conduit shall be 3/4-inch minimum trade size. Supports shall be installed at distances required by the NEC. Conduit support design shall be by the CONTRACTOR.

D. Conduit shall not be encased in the bottom floor slab below grade.

E. Concrete cover for conduit and fittings shall not be less than 1-1/2 inches for concrete exposed to earth or weather, or less than 3/4-inch for concrete not exposed to weather or in contact with the ground.

F. Raceways passing through a slab, wall, or beam shall not impair significantly the strength of the construction.

G. Raceways embedded within a slab, wall, or beam (other than those merely passing through) shall satisfy the following:
   1. Conduits with their fittings embedded within a column shall not displace more than 4 percent of the gross area of cross section.
   2. Conduits shall not be larger in outside dimension than one third the overall thickness of slab, wall, or beam in which embedded.
   3. Raceways shall not be spaced closer than 3 outside diameters on centers.

H. Raceways shall be placed so that cutting, bending, or displacing reinforcement from its proper location will not be required.

I. Threads shall be coated with a conductive lubricant before assembly.

J. Joints shall be tight, thoroughly grounded, secure, and free of obstructions in the pipe. Conduit shall be adequately reamed to prevent damage to the wires and cables inside. Strap wrenches and vises shall be used to install conduit to prevent wrench marks on conduit. Conduit with wrench marks shall be replaced.

K. Wherever raceways enter substructures below grade, the raceways shall be sloped to drain water away from the structure. Extreme care shall be taken to avoid pockets or depressions in raceways.

L. Connections to lay-in type grid lighting fixtures shall be made using LFMC not exceeding 4-feet in length. Connections to motors and other equipment subject to vibration shall be made with LFMC not exceeding 3-feet in length. Equipment subject to vibration that is normally provided with wiring leads shall be provided with a cast junction box for the make-up of connections. The junction box is to be independently supported and not left free to hang from the equipment.

M. Raceways passing through walls or floors shall have plastic sleeves. Core drilling shall be performed in accordance with Section 26 05 00.

N. Provide raceway seal fittings at the following locations:
   1. In hazardous classified locations, in strict accordance with the NEC.

O. Conduit, fittings, and boxes required in hazardous classified areas shall be suitably rated for the area and shall be provided in strict accordance with NEC requirements.

P. Empty raceways shall be tagged at both ends to indicate the final destination. Where it is not possible to tag the raceway, destination shall be identified by a durable marking on an adjacent surface. A pull-cord shall also be installed in each empty conduit. This shall apply to conduits in floors, panels, manholes, equipment, etc.

Q. Where an underground raceway enters a structure through a concrete roof or a membrane waterproofed wall or floor, core-drill the entrance and provide a Link-Seal, or equal, sealing device. The sealing device shall be utilized with rigid steel conduit.

R. Final connections to heaters, instruments, motors, limit switches, and any equipment subject to vibration shall be made with LFMC and approved fittings. Maximum length of LFMC shall be 3 feet.

S. Connections to solenoid valves, pilot actuators, and flood sensors shall be made with LFMC and approved fittings to a cast box with screw cover (GUA type), independently and securely supported. In no case is the device to support the cast box.

3.3 CABLE TRAYS

A. Cable trays are not to be used.

END OF SECTION 26 05 33

SECTION 26 05 43 – UNDERGROUND RACEWAY SYSTEMS

PART 1 - GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall provide underground raceway systems, including trenching, backfill, compaction, and restoration, complete and in place, in accordance with the Contract Documents.

1.2 CONTRACTOR SUBMITTALS

A. Furnish submittals in accordance with MASS Section 10.05 Article 5.6, and 26 05 00 – Electrical Work, General.

B. Shop Drawings
   1. Complete catalog cuts of all conduit, fittings, and pullboxes, marked where applicable to show proposed materials and finishes.

C. Record Drawings
   1. Show routings, burial depths, and pullbox locations and sizes.

PART 2 - PRODUCTS

2.1 GENERAL

A. Pullboxes, and fittings that are dedicated to the underground raceway system shall comply with the requirements of this Section.

2.2 PULLBOXES

A. Shall be precast with construction and load rating as indicated.
   1. Covers shall be traffic type, H-20 loading, except as indicated otherwise.
   2. Pullbox covers shall be identified as "Electric" by raised letters cast into the covers.

B. Shall have frost-proof and water-tight grey iron frames and covers with solid lids and inner lids with 28-inch clear openings. Covers and lids shall be bolted to cast-in-place steel frames with corrosion resistant hardware. Frames shall be factory-primed; covers shall be cast-iron and shall have pick-holes.

C. Shall be equipped with pulling-in irons opposite and below each raceway entrance.

D. Unless noted otherwise, pull boxes shall have closed bottoms. Open bottom pullboxes will not be accepted.

E. Precast pullboxes shall be **Jensen Precast, Mack, Quikset, U.S. Precast**, or equal. Cast-iron covers shall be by **U.S. Foundry**, or equal.

F. Pull boxes are not anticipated for use on this project.

2.3 UNDERGROUND CONDUITS

A. Underground raceways shall be:
   1. Schedule 80 PVC conduit as indicated, sunlight resistant. Conduit shall be manufactured in accordance with NEMA TC-2 - Electrical Plastic Tubing and Conduit, and UL-651 - Standard for Rigid Non-metallic Conduit.
      or where called for on the Drawings,
   2. HDPE for buried horizontal runs shall be Listed. Compliant with NEC articles 300 and 353 and Listed to UL 651 A&B.

B. Identification Tape: Continuous lengths of underground warning tapes shall be installed 12-inches above and parallel to conduits. Tape shall be 6-inches wide polyethylene film imprinted "CAUTION - ELECTRIC UTILITIES BELOW." Tape shall have non-ferrous metal foil conductor sandwiched in the tape for detection purposes. Tape shall be as manufactured by **Brady**, or equal.

PART 3 - EXECUTION

3.1 GENERAL

A. Underground raceways shall be installed between structures and pullboxes as indicated. Raceway systems shall be electrically and mechanically complete before conductors are installed. Bends and offsets shall be smooth and symmetrical, and shall be fabricated with tools designed for this purpose. Factory elbows shall be utilized wherever possible. Unless otherwise noted provide plastic (PVC) coated GRC for vertical sweeps and risers.

B. Raceway routing shall be adjusted to avoid obstructions.

3.2 INSTALLATION

A. Raceways shall be installed in accordance with the criteria below:
   1. Raceway shall be laid on a grade line of at least 3-inches per 100-feet, sloping towards pullboxes or structures. Conduit shall be installed and pullbox depths adjusted so that the top of the conduit is a minimum of 24-inches below grade and a minimum of 24-inches below roadways, driveways, and bike trails.
   2. Changes in direction of the duct envelope by more than 10 degrees horizontally or vertically shall be accomplished using factory elbows.
   3. Raceway shall be installed in accordance with the Manufacturer’s requirements and recommendations. The bottom of trench shall be of select backfill or sand, or as indicated on the PLANS.

4. Each of the completed raceways shall be cleaned by drawing through it a standard flexible mandrel one foot long and 1/4-inch smaller than the nominal size of the duct. After passing of the mandrel, a wire brush and swab shall be drawn through.
5. Provide heat shrink tubing around conversion fittings when converting between different raceway materials (i.e.: HDPE to PVC coated RSC).

B. Sections of pre-fabricated pullboxes shall be assembled with waterproof mastic and shall be set on a 6-inch bed of gravel or as recommended by the manufacturer.

C. Raceway penetration through walls of structures and pullboxes below grade shall be watertight.

D. When raceway enters a building, conduit shall transition to rigid steel PVC-coated conduit on stub-up.

E. Where an underground raceway enters a structure through a concrete wall, provide a **Link-Seal**, or equal sealing device. The sealing device shall be utilized with plastic coated rigid steel conduit. Transition from PVC to plastic coated GRC prior to building entry.

3.3 RESTORATION

A. The CONTRACTOR shall restore all disturbed areas.

B. Grassed areas shall be backfilled, compacted, and topsoiled and reseeded in accordance with MASS.

C. Asphalt concrete driveways, bike trails, and roadways and curb and gutter shall be cut and patched to match existing in accordance with MASS, including backfill and compaction to 95 percent density. Reference the conduit trench detail shown on the drawings, with a depth of 24 inches.

END OF SECTION 26 05 43

SECTION 26 05 73 – PROTECTIVE DEVICE STUDY

PART 1 - GENERAL

1.01 THE REQUIREMENT

A. The CONTRACTOR shall perform the indicated short circuit and protective device studies for the electrical power system in accordance with the Contract Documents.

B. The WORK of this Section shall include protection studies for motors with solid state overload and overcurrent protection devices.

C. It is the responsibility of the CONTRACTOR to obtain the information required from the electric utility and appropriate vendors.

D. The study shall include the typical operating arrangements of the power electrical system as shown in the table below:

CEA Utility Service	Optional Standby Generator
X	O
O	X

Note: 1. X – Power Supply ON
O – Power Supply OFF

1.02 QUALIFICATIONS

A. Short circuit studies, protective device evaluation studies, arc-flash hazard analysis studies, and protective device coordination studies shall be performed by a manufacturer who has been regularly engaged in short circuit and protective device coordination services for a period of at least 15 years.

B. The indicated studies shall be signed by the professional electrical engineer, registered in the State of Alaska, responsible for the studies.

C. The studies shall utilize computer programs with proven reliability and accuracy for performing 3-phase fault-duty calculations.

1.03 CONTRACTOR SUBMITTALS

A. The indicated studies shall be submitted and approved by the ENGINEER prior to final approval of the distribution equipment Shop Drawings and release of equipment for manufacture.

B. An initial short circuit study shall be submitted and reviewed before the ENGINEER will approve the Shop Drawings for switchgear, transformers, or 480-

volt distribution equipment. The initial short circuit study shall be submitted within 30 days of CONTRACTOR Notice to Proceed.

C. The initial protective device coordination study shall be submitted within 90 days after the approval of the initial short circuit study.

D. The short circuit, arc-flash hazard analysis, and protective device coordination studies shall be updated prior to Project Substantial Completion; utilize characteristics of as- installed equipment and materials.

E. The adequacy of the equipment "withstand" and interruption ratings shall be approved by the ENGINEER.

1.04 MANUFACTURERS' SERVICES

A. The low-voltage switchgear manufacturer shall furnish the services of a qualified field engineer and necessary tools and equipment in order to test, calibrate, and adjust the protective relays and circuit breaker trip devices as recommended in the power system coordination study.

B. The motor control center manufacturer shall furnish the services of a qualified field engineer to calibrate the MCPs as recommended in the power system study.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 GENERAL

A. The studies shall include development of single-line and impedance diagrams of the power system.

B. The diagrams shall identify components considered in the study and the ratings of power devices, including transformers, circuit breakers, relays, fuses, busses, and cables.

C. The resistances and reactances of cables shall be identified in the impedance diagram.

D. The studies shall contain written data from the electric utility company regarding maximum and minimum available short circuit current, voltage, and X/R ratio of the utility power system.

E. The studies shall include every protective device and feeder included or modified within the WORK.

F. The first upstream overcurrent device outside the WORK shall be used as a fixed reference.

G. The studies shall include all portions of the electrical distribution system for normal and standby power sources down to and including the 240-volt distribution system.

3.02 SHORT CIRCUIT STUDY

A. The short circuit study shall be performed with the aid of a digital computer program, and shall be in accordance with the following Standards:

ANSI/IEEE 141	Recommended Practice for Electrical Power Distribution for Industrial Plants
ANSI/IEEE 242	Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems
IEEE 551	Recommended Practice for Calculating AC Short-Circuit Currents in Industrial and Commercial Power Systems

3.03 PROTECTIVE DEVICE EVALUATION STUDY

A. A protective device evaluation study shall be performed in order to determine the adequacy of circuit breakers, molded case switches, and fuses.

B. Any problem areas or inadequacies in the equipment due to prospective short-circuit currents shall be promptly brought to the attention of the ENGINEER.

C. Do not utilize series-rated circuit breakers to meet short circuit requirements for this project without written approval of the ENGINEER.

D. Devices shall be fully rated to withstand available fault currents.

3.04 PROTECTIVE DEVICE EVALUATION STUDY

A. A protective device coordination study shall be performed in order to develop the necessary calculations to select power fuse ratings, protective relay characteristics and settings, ratios and characteristics of associated current transformers, and low-voltage breaker trip characteristics and settings.

B. Any problem areas or inadequacies in the equipment due to prospective short-circuit currents shall be promptly brought to the ENGINEER's attention.

3.05 TIME/CURRENT COORDINATION CURVES

A. As a minimum, the time/current coordination curves for the power distribution system shall include the following items plotted on 5-cycle log-log graph paper:

1. Time/current curves for each protective relay, circuit breaker, or fuse demonstrating graphically that the settings will provide protection and selectivity within industry standards.
2. Each curve shall be identified, and tap and time dial settings shall be specified.
3. Provide individual curves for each feeder unless identical to others.
4. Selectivity

a. Time/current curves for each device shall be positioned to provide the maximum selectivity to minimize system disturbances during fault clearing.

b. Where selectivity cannot be achieved, the ENGINEER shall be notified as to the cause.

c. Recommendations shall be included for alternate methods that would improve selectivity.

5. Time/current curves and points for cable and equipment damage.

6. Circuit interrupting device operating and interrupting times.

7. Indicate maximum fault values on the graph.

8. Sketch of bus and breaker arrangement.

9. Magnetizing inrush points of transformers.

10. Thermal limits of dry-type and liquid-insulated transformers (ANSI damage curve).

11. Every restriction of the ANSI and National Electrical Code shall be followed, and proper coordination intervals and separation of characteristics curves shall be maintained.

3.06 ARC FLASH STUDY

A. An arc flash study shall be performed with the aid of a digital computer program in order to determine the “Arc Flash Protection Boundary” and “Personal Protective Equipment” (PPE) levels for applicable electrical distribution equipment, stand-alone disconnects, starters, and VFDs in the power distribution system.

B. The arc flash study shall be performed in conjunction with short circuit calculations and protective device coordination.

C. The arc flash study shall be in accordance with the latest version of the following Standards:

NFPA 70E	Standard for Electrical Safety Requirements for Employee Workplaces
IEEE 1584	IEEE guide for performing Arc Flash Hazard Calculations
OSHA (29 CFR PART 1910)	Occupational Safety and Health Standards for General Industry
ANSI Z535.4	Product Safety Signs and Labels

D. The recommended values for the “Arc Flash Protection Boundary” and PPE levels, based on the arc flash study results, shall be tabulated in the study.

E. The Arc Flash analysis shall include calculations for maximum and minimum contributions of the fault current magnitude. The minimum calculation shall assume that the utility contribution is at a minimum and shall assume a minimum motor load. Conversely, the maximum calculation shall assume a

maximum contribution from the utility and shall assume motors to be operating under full-load conditions.

F. Arc Flash computation shall include both line and load side of main breaker calculations, where necessary.

G. Arc Flash calculations shall be performed for each generator supplying power and utility supplying power.

H. Labeling

1. The digital computer program shall provide the “Arc Flash Protection Boundary” and PPE values in a format that can be directly printed on to labels for the worst case result.

2. The CONTRACTOR shall provide (furnish and post in the field) these labels on all switchboards, panelboards and protective devices in accordance with NFPA 70E and OSHA.

3. The CONTRACTOR shall merge the arc flash results and provide a complete list for a worst case value for each bus.

4. Labels shall be printed on a self-sticking vinyl film. Paper labels will not be allowed.

3.07 FINAL SUMMARY REPORT

A. Summarize the results of the indicated power system studies in a final report.

B. The report shall include the following items:

1. Single-line diagram

2. Impedance diagram

3. Tabulation of all protective devices identified on the single line diagram

4. Time/current coordination curves

5. Specific recommendations, if any

6. Test instrumentation, condition, and connections, as applicable, for each study

7. Computerized fault current calculations

8. Any suggested changes to the protection scheme or equipment selection that will result in improved system reliability and safety

9. Recommendations to minimize the arc flash energy

C. The report shall include information concerning the computer program used for the study, as well as a general discussion of the procedure, items, and data considered in the preparation of the study.

D. Submit four (4) bound copies of the report to the ENGINEER.

3.08 PROTECTIVE DEVICE TESTING, CALIBRATION, AND ADJUSTMENT

A. Test, calibrate, and adjust the protective relays and circuit breaker trip devices in accordance with the recommendations in the power system coordination study.

B. Calibrate the MCPs as in accordance with the recommendations in the power system study.

C. Adjustments shall be made prior to energizing any electrical equipment.

END OF SECTION

SECTION 26 22 00.05 – DRY TYPE TRANSFORMERS

PART 1 - GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall provide dry-type transformers, complete and operable, in accordance with the Contract Documents.

B. Single Manufacturer: Like products shall be the end product of one manufacturer in order to achieve standardization of appearance, operation, maintenance, spare parts, and manufacturer's services.

1.2 CONTRACTOR SUBMITTALS

A. General: Submittals shall be in accordance with MASS Section 10.05 Article 5.6 and Section 26 05 00 – Electrical Work, General.

B. Shop Drawings
   1. Transformers
      a. Dimension drawings
      b. Technical certification sheets
      c. Drawing of conduit entry/exit locations
      d. Transformer ratings, including:
         1) Voltage
         2) Continuous current
         3) Basic impulse level for equipment over 600 volts
         4) kVA
         5) Impedance
         6) Temperature Rise
      e. Descriptive bulletins
      f. Product sheets

PART 2 - PRODUCTS

2.1 GENERAL

A. Transformers
   1. The transformers shall be dry-type, designed, manufactured, and tested in accordance with the latest applicable standards of ANSI and NEMA.
   2. Transformers shall be UL-listed and bear the UL label.

2.2 TRANSFORMERS

A. Ratings
   1. kVA and voltage ratings shall be as indicated.
   2. Transformers shall be designed for continuous operation at rated kVA, for 24 hours a day, 365 days a year operation, with normal life expectancy as defined in ANSI C57.96 - Guide for Loading Dry Type Distribution and Power Transformers
   3. Transformer sound levels shall not exceed the following ANSI and NEMA levels for self-cooled ratings:
      Up to 9 kVA 40 db
      10 to 50 kVA 45 db
      51 to 150 kVA 50 db

B. Construction
   1. Insulation Systems
      a. Transformers shall be insulated as follows:
         1) 2 kVA and below: 150 degrees C insulation system based upon 80 degree C rise.
         2) 3 to 15 kVA: 185 degrees C insulation system based upon 115 degrees C rise.
         3) 15 kVA and above: 220 degrees C insulation system based upon 150 degrees C rise.
      b. Required performance shall be obtained without exceeding the above indicated temperature rise in a 40 degrees C maximum ambient.
      c. All insulation materials shall be flame-retardant and shall not support combustion as defined in ASTM D 635 – Test Method for Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position.
   2. Transformer windings shall be copper.
   3. Transformers rated 15kVA and above shall have four 2-1/2 percent taps, two above and two below 480 volts.

C. Manufacturers: Transformers shall be floor- or wall-mounted type by **General Electric, Cutler-Hammer, Square D**, or equal.

PART 3 - EXECUTION

3.1 GENERAL

A. All WORK of this Section shall be installed as indicated in Section 26 05 00 – Electrical Work, General.

END OF SECTION 26 22 00.05

SECTION 26 24 16.05 – PANELBOARDS

PART 1 - GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall provide panelboards complete and operable, in accordance with the Contract Documents.

B. Single Manufacturer: Like products shall be the end product of one manufacturer in order to achieve standardization of appearance, operation, maintenance, spare parts, and manufacturer's services.

C. The CONTRACTOR shall field verify the existing installation and coordinate the installation of new panelboards and similar products with the location of existing equipment.

1.2 CONTRACTOR SUBMITTALS

A. General: Submittals shall be in accordance with MASS Section 10.05 Article 5.6 and Section 26 05 00 – Electrical Work, General.

B. Shop Drawings
   1. Breaker layout drawings with dimensions and nameplate designations
   2. Component list
   3. Drawings of conduit entry/exit locations
   4. Assembly ratings including:
      a. Short circuit rating
      b. Voltage
      c. Continuous current
   5. Cable terminal sizes
   6. Descriptive bulletins
   7. Product sheets
   8. Installation information
   9. Seismic certification and equipment anchorage details

PART 2 - PRODUCTS

2.1 PANELBOARDS

A. Panelboards shall be dead front factory assembled. Panelboards shall comply with NEMA PB-1-Panelboards, as well as the provisions of UL 50 – Safety Enclosures for Electrical Equipment and UL 67 – Safety Panelboards. Panelboards used for service equipment shall be UL labeled for such use. Lighting panelboards shall be rated for

120/240-volt for single phase operation as indicated. Power panelboards shall be rated for 480 volts, 3-phase, 3-wire operation.

B. The manufacturer of the panelboard shall be the manufacturer of the major components within the assembly, including circuit breakers.

C. Ratings
   1. Panelboards rated 240 VAC or less shall have short circuit ratings not less than 10,000 amps RMS symmetrical or as indicated by the Short Circuit Study, whichever is greater.
   2. Panelboards rated 480 VAC shall have short circuit ratings not less than 25,000 amps RMS symmetrical or as indicated by the Short Circuit Study, whichever is greater.
   3. Panelboards shall be labeled with a UL short circuit rating. Series ratings are not acceptable.
   4. Service entrance panelboards (panels connected to transfer switches or power meters) rated 480 VAC or less shall have short-circuit rating not less than 65,000 amps RMS symmetrical, unless a reduced rating is recommended by the Protective Device Study.
   5. The VFD circuit breakers shall be time-delay units, shall be UL-listed for VFD loads, and approved by the VFD manufacturer for protection of their drives.

D. Construction
   1. All lighting and power distribution panels shall have copper bus bars.
   2. Breakers shall be one, two, or three pole as indicated, with ampere trip ratings as required by the equipment. Breakers shall be quick-make and quick-break, inverse time trip characteristics, to trip free on overload or short circuit, and to indicate trip condition by the handle position.
   3. The panels shall have hinged doors with combination catch and latch. The front panels shall be so arranged that when the plates are removed, the gutters, terminals and wiring will be exposed and accessible. The doors shall have inner doors within the plates to have only the breaker operating mechanism exposed when they are opened. Live conductors and terminals shall be concealed behind the plates.
   4. All panelboards shall be rated for the intended voltage.
   5. All circuit breakers shall be interchangeable and capable of being operated in any position as well as being removable from the front of the panelboard without disturbing adjacent units. No plug-in circuit breakers will be acceptable.
   6. Lighting and power distribution panels which are not part of a motor control center shall be constructed in accordance with Section 26 05 00 – Electrical Work, General. Panels shall have the necessary barriers, supports, and liberal wiring gutters. Trim screws shall be stainless steel. All panelboard parts of metal other than copper, aluminum, or stainless steel shall be cadmium plated. Panelboards shall be as manufactured by **Allen-Bradley, General Electric, Square D,** or **Cutler-Hammer**.
   7. Panelboards shall be UL listed except for special enclosures which are not available with UL listing.

8. Panelboards shall be suitable for use as service entrance as indicated or as otherwise required by the N.E.C.

PART 3 - EXECUTION

3.1 GENERAL

A. All WORK of this Section shall be installed as indicated in Section 26 05 00 – Electrical Work, General.

END OF SECTION 26 24 16.05

SECTION 26 24 19 – LOW VOLTAGE MOTOR CONTROL CENTERS

PART 1 - GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall provide motor control centers (MCC's), complete and operable, in accordance with the Contract Documents.

B. The requirements of Division 26 Specification Sections apply to the WORK of this Section.

1.2 QUALITY ASSURANCE

A. General: All materials shall be inspected for compliance with Section 26 05 00 – Electrical Work, General, and shall be tested per Section 26 01 26 – Electrical Tests.

B. The MCC assembly and its components shall be of the manufacturer's latest approved design. MCCs and components shall meet the UL-845 and IEC 60439-1 requirements and bare the appropriate labels.

C. Modifications to an existing MCC shall be field evaluated to UL 845 and any other applicable standard as required by the components comprising the modified assembly. Individually listing MCC "buckets" to UL 508A is not acceptable.

D. Factory Tests: Design test reports conducted on similar assemblies at the factory testing facilities shall be submitted.

1.3 WARRANTY

A. The system warranty shall be no less than one year after initial startup and shall include all costs for repair, parts, travel and living expenses, and labor.

1.4 OPERATION AND MAINTENANCE

A. The CONTRACTOR shall submit operation and maintenance procedures for each of the new MCCs for the ENGINEER's review. The data sheets shall be supplemented by written text and shall include the following:
   1. Operating procedures.
   2. Maintenance procedures.
   3. Manufacturers' parts list, illustrations, assemblies, and diagrams.

1.5 CONTRACTOR SUBMITTALS

A. General: Submittals shall be in accordance with MASS Section 10.05 Article 5.6.

B. Shop Drawings
   1. Enclosure NEMA rating and color
   2. Horizontal and vertical bus ampacities, voltage rating and interrupting capacity. Include materials of construction
   3. Ground bus size and material of construction
   4. Conduit entrance provisions
   5. Main incoming line entry provision (top or bottom)
   6. Control unit nameplate schedule
   7. All circuit breaker types, frames and settings
   8. All starter NEMA sizes, auxiliary contact provisions, coil voltage
   9. Relays, timers, pilot devices, control transformer VA and fuse sizes
   10. Elementary schematic ladder diagrams for each compartment. Custom schematics shall be furnished. Diagrams shall include all remote devices. Submittals with drawings not meeting this requirement will not be reviewed further and will be returned to the CONTRACTOR stamped "REJECTED-RESUBMIT."
   11. Short circuit rating of the complete assembly
   12. Replacement parts lists and operation and maintenance procedures
   13. Seismic design certification of the anchoring system in accordance with Section 26 05 00.
   14. Time-current curves for all protective devices

PART 2 - PRODUCTS

2.1 GENERAL

A. Devices of the same type shall be products of the same manufacturer.

B. Motor control centers shall conform to the standards for NEMA Class IIS, type B diagrams and wiring. All equipment within the MCC shall be front accessible.

C. MCC Schedule

MCC Designation	Location	Drawing
MCC	PS12 Control Room	E1.1
MAIN	PS12 Control Room	E1.1

The MCC shall contain all items and accessories required for a complete working system.

2.2 DESIGN, CONSTRUCTION, AND MATERIAL REQUIREMENTS

A. Motor Control Centers (MCC)
   1. Shall be 600-volt class suitable for operation on a three-phase, 60-Hz system.

2. The system operating voltage and number of wires shall be as indicated.

B. Enclosure
   1. Shall be NEMA Type 1, gasketed enclosure.
   2. Compartment doors shall be interlocked with compartment circuit breakers.
   3. The interlock shall be fitted with a maintenance override.

C. Unless otherwise indicated, the vendor shall provide a quotation for Type 2 Arc-Resistant MCC that is designed, constructed, and tested to withstand the effects of an internal arcing fault.
   1. The MCC shall be successfully tested in accordance with the requirements of IEEE C37.20.7.
   2. Doors shall be capable of withstanding the effects of an internal arcing fault as proven by successful testing per IEEE C37.20.7.
   3. Arc-resistant design shall withstand arcing durations for a minimum of 0.5 seconds (2 cycles) at rated power and frequency of equipment. The arc- resistant design shall not be based on the function of high-speed fault detectors that are sensitive to light, pressure, or heat.
   4. Arc-resistant design testing shall be performed per the IEEE C37.20.7 using the maximum short-circuit current available for the system or devices rating as the perspective current available at the incoming bus terminals of the test sample.

D. Arc-resistant motor controllers shall have the following features:
   1. Insulation of the bus extension cover-plates.
   2. Arc-containment unit door latches.
   3. Vertical wireway doors shall be provided with arc resistant latches to help keep the door latched in the event that an internal arcing fault occurs

E. Size and Arrangement
   1. Motor control centers shall be of mechanical groupings of control center units, assembled into a lineup of control center sections. Each control section shall be sized as shown on the drawings.
   2. MCCs shall be designed to not exceed the space requirements as indicated on the Contract Drawings, including spaces, spares, and future compartments. MCCs shall be subject to rejection for exceeding the lengths indicated where allotted space is critical.
   3. Equipment within the MCC may be rearranged at the discretion of the manufacturer, providing the MCC provides the spares, space, and future provisions indicated.
   4. All switches and circuit breakers used as switches shall be located so that the center of the grip of the operating handle of the switch or circuit breaker, when in its highest position, will not be more than 6-feet 7-inches above the floor, including the height of the concrete pad.
   5. All MCC sections shall be 20” deep.

F. Components
   1. Busses

a. A continuous copper ground bus shall be provided with full width of the motor control center line-up.
b. The main horizontal bus shall be tin-plated copper located within an isolated compartment. The bus shall be rated as indicated on the Contract Drawings minimum, but in no instance less than the main lug or main breaker frame size.
c. The vertical bus in each section shall consist of a single tin-plated copper conductor per phase. The vertical bus shall be completely isolated and insulated, and shall extend the full height of the section wherever possible.
d. All power busses shall be braced to withstand 65,000 amps, minimum.
e. All bus compartments shall provide complete enclosure from cable termination areas.
f. The lugs on the bus shall be round.

2. Wireways
a. A separate vertical wireway shall be provided adjacent to each vertical unit, and shall be covered by a hinged door.
b. Each individual unit compartment shall be provided with a side barrier to permit pulling wire in the vertical wireway without disturbing adjacent unit components.

3. Distribution Section: The distribution section shall consist of molded case circuit breakers of the size indicated.

G. Cabinet
1. Structural members shall be fabricated of not less than 12-gauge steel and side and top panels and doors shall be not less than 14-gauge steel.
2. Spaces designated as "SPACE" or "EMPTY" shall include blank hinged doors and vertical bus bars.
3. Control units inside compartments shall be clearly identified with tags or stencil markings.
4. Each control unit including spares, spaces and blanks, lights, and devices shall be identified by an engraved nameplate. Identification shall include circuit number as indicated.
5. Each motor control center shall be fitted with the manufacturer's nameplate which shall include the NEMA Standard electric rating and other pertinent data, including manufacturer, sales order number, date of manufacture, and place of manufacture.
6. Fans, heat exchangers, transformers, capacitors, junction boxes, or other devices may not be mounted on the outside of the motor control center enclosure.

H. Control Wiring:
1. All control wiring shall be brought to identified terminal blocks; every cubicle containing control wiring which extends to other cubicles shall have terminal blocks. Connection made on terminal blocks and on internal devices shall be by means of locking spade-type pre-insulated terminals.
2. Control and secondary wiring shall be 600 V flame-retardant switchboard-type, minimum size No. 14 AWG, stranded tinned copper. Hinge wiring shall be extra-flexible stranding.

I. Terminal Blocks
   1. Terminal blocks for all external control connections shall be 600-volt, barrier type, having a minimum rating of 20 amps with marker strips identifying all internal and external wiring.
   2. Terminal blocks for current transformer secondary connections shall be of the short-circuiting type. One 4-pole block shall be used for each current transformer set.

J. Instrument Transformers
   1. Current Transformers: The quantity and ratio of current transformers shall be as indicated. Current transformers shall have thermal and mechanical ratings and insulation class not less than those of the associated circuit breakers. Current transformers shall be mounted in such a way as to provide easy access for inspection and maintenance.
   2. Provide test blocks and plugs for current and potential circuits for the main breaker(s).

K. Nameplates
   1. Nameplates shall be provided for front and rear face of each cubicle and for major devices thereon, such as meters, instruments, control switches, and relays.
   2. Nameplates shall also be provided for major internal devices such as relays, instrument and control power transformer, fuse blocks, switches, and transformers.
   3. Cubicle nameplates shall be 3-layer laminated phenolic plastic, white background, engraved to show black lettering.
   4. Lettering shall be upper case as follows:
      a. 1-inch high for switchgear identification.
      b. 7/16-inch high for compartment identification.
      c. 1/8-inch high for component nameplate.
   5. Thickness
      a. Nameplates 1-1/2 inches tall and smaller shall be 1/16-inch thick.
      b. Nameplates larger than 1-1/2 inches tall shall be 1/8-inch thick.
   6. Edges of nameplates shall be beveled.
   7. Nameplates shall be fastened to equipment with stainless steel rivets or screws.

L. Surface Preparation, Painting, and Cleanliness
   1. Metal surfaces shall be smooth and free of all foreign matter such as scale, sand, blisters, weld splatter, metal chips and shavings, oil, grease, organic matter, and rust, and shall be chemically cleaned and treated in a process which provides a phosphate coating.
   2. Immediately after the treatment process, the surfaces shall be sprayed with a coating each of primer and finish paint; both shall be baked. Electrostatically deposited powder coated epoxy finishes, oven baked and 1-mil minimum thickness indoor and 2 mils minimum thickness outdoor, are acceptable.

3. All surfaces shall be finish painted light gray No. 61. The manufacturer's standard practice of double-tone finish on the low voltage switchgear section is acceptable.
4. Two spray cans of air-drying paint of each color tone shall be furnished to the ENGINEER.

2.3 FULL VOLTAGE NON-REVERSING (FVNR) MOTOR STARTERS

A. Motor starters shall be mounted in standard motor control center assemblies, arranged as indicated.

B. Each motor starter unit shall consist of a combination magnetic contactor and short circuit protective device, mounted in a completely enclosed cubicle. Short circuit protective device shall be an instantaneous, magnetic only circuit breaker, **Cutler-Hammer Type HMCP**, or equal. All circuit breakers provided as part of a motor starter unit shall be capable of being padlocked in the open position.

C. Three-phase overload trip units shall be furnished to suit the full load current of the equipment installed. The overload unit shall be **Allen-Bradley Model E300 solid-state overload relay**, or equal. Reset of the overload unit shall be possible with the unit door, or front panel, closed. Contacts and outputs on the E300 unit are to be wired as required by electrical motor control diagrams.

D. The combination motor starters shall be drawout-type for size 5 and below. The fixed-type unit assembly shall be constructed so that it can be easily removed from its panel after disconnecting the wires to the terminal block and withdrawing from the primary bus. Removal of a unit assembly shall be possible without rear access and without disturbing any other unit in the motor control center.

E. Each starter unit shall have its own control power transformer. It shall have a 120-volt grounded secondary. One secondary fuse and two primary fuses shall be provided. Control power transformers shall be sized to accommodate the control devices indicated. Local control devices shall be mounted independently of the cover door. All starters shall have a local green "running" lamp. Starters shall be provided with hand/off/auto selector switches, and other devices as indicated. All cubicle control wires shall be terminated at a pull apart disconnecting terminal block at the cubicle.

F. The motor control center manufacturer shall be responsible for identifying each control wire within each motor starter unit with wrap-around permanent plastic markers. Each control wire shall be identified at both ends.

G. Full voltage motor starter units shall be NEMA Size 1 or larger. Each combination starter shall be rated for a minimum 25,000 RMS symmetrical amperes.

H. Motor starters shall be designed to NEMA ratings. Only starters designed to IEC ratings or with dual IEC/NEMA ratings are acceptable as soft-start bypass contactors.

2.4 REDUCED VOLTAGE SOLID STATE (RVSS) MOTOR STARTERS

A. RVSS starter assemblies shall be UL-listed and shall consist of
   1. an incoming power circuit breaker,
   2. a power section,
   3. logic board,
   4. protective fusing, and
   5. Paralleling bypass contactor to be energized when the starter reaches full voltage.

B. In addition, MCC installation of RVSS starters shall meet all of the applicable requirements listed in 2.3 above.

C. RVSS starters shall include adjustments for starting torque, acceleration rate control by voltage ramps, and current limit.

D. Output contactors shall be provided where indicated.

E. RVSS Motor Starters are not anticipated for use on this project.

2.5 VARIABLE FREQUENCY DRIVES (VFD)

A. VFD installation in MCC's shall meet all the applicable requirements listed in 2.3 above and incorporate the following:
   1. Additional cooling required to operate the VFD on a continuous basis at its least efficient speed.
   2. All incoming and outgoing conductors shall be routed away from all other power and control conductors. If separation is not feasible, VFD based power and control shall be run in metallic conduit.

B. VFD's shall be provided in accordance with SECTION 26 29 23 – VARIABLE FREQUENCY DRIVE UNITS.

2.6 MAIN AND FEEDER CIRCUIT BREAKERS (480/240/208-VOLT)

A. Circuit breakers having a frame size of 150 amps or less shall be molded-case type with thermal magnetic non-interchangeable, trip-free, sealed trip units, unless indicated otherwise on the Plans.

B. Circuit breakers with a frame size of 225 amps to 1,200 amps shall be molded case with RMS sensing electronic trip elements as indicated on the Plans.

C. The interrupting capacity of all main, and feeder branch circuit breakers shall be a minimum of 25,000 RMS symmetrical amperes.

D. Circuit breaker disconnect operators shall be capable of accommodating three padlocks for locking in the "open" position.

E. Provide neutral pad or neutral bar for future 4-Wire WYE service.

2.7 TRANSFORMERS

A. All indoor transformers shall be dry-type and shall conform to or exceed the requirements of the latest applicable IEEE, NEMA and ANSI standards.

B. Transformers rated 15 kVA and above shall have 4 2-1/2 percent taps, 2 above and 2 below 480 volts. Transformers shall be enclosed within the MCC.

C. Additional requirements for transformers are specified in Section 26 22 00.05 – Dry Type Transformers.

2.8 CONTROL DEVICES

A. All control devices shall conform to the requirements of Section 2514 05 – Local Control Stations and Miscellaneous Electrical Devices.

B. Provide solid state type metering where indicated. Include CTs of ratios as indicated.

C. The metering equipment shall be housed in a separate compartment and shall be isolated from adjacent elements by steel or appropriate insulated barriers. See SECTION 25 36 16 MONITORING TRANSDUCERS.

2.9 ETHERNET INTERFACE

A. General
   1. The MCC shall have Cat6A Ethernet/IP cabling as shown schematically on drawings.
   2. Each motor starter, VFD, and RVSS in the MCC shall be supplied with a means to communicate via Ethernet/IP,
   3. Bridges and Protocol Convertors are not permitted.
   4. All units shall be interwired and tested as a NEMA Class II MCC.

B. Ethernet/IP Cable
   1. The Ethernet/IP cable shall be UL Listed and have an insulating rating of 600V, i.e., no special separation, barriers, or internal conduit is required for the Ethernet/IP conductors.

   2. The addition or removal of a unit from the Ethernet/IP system shall not interrupt the operation of other units within the system.

C. Ethernet/IP Cable Layout
   1. An Ethernet/IP trunkline shall be routed through the MCC line-up, behind barriers that isolate the trunkline from the unit space and wireways to prevent accidental mechanical damage during MCC installation.

2. Ethernet/IP ports shall be provided in the rear of each vertical wireway to simplify installation, relocation, and addition of plug-in MCC units.
3. The Ethernet/IP component within each plug-in shall be connected to one of the Ethernet/IP ports in the vertical wireway with cable as outlined above in Section B – Ethernet/IP Cable.

D. Ethernet/IP System Performance
1. The Ethernet/IP system shall be designed to operate at 10/100-BASE-T to maximize the system performance.
2. The Ethernet/IP system is to be qualified to communicate and perform under normal and adverse MCC electrical environments (e.g., contactor electrical operation, contactor jogging duty, and unit short circuit fault).

E. Ethernet/IP Units
1. Motor Starter Units
a. Each motor starter shall have an electronic overload relay with the following features:
1) Ethernet/IP communication
2) LEDs for status indication
3) Test/Reset button
4) Adjustable trip class (5 to 30)
5) General purpose I/O (minimum 4 inputs, 3 outputs), rated for 110-120 VAC or 24 VDC as specified on drawing.
6) Protective functions with programmable trip level, warning level, time delay and inhibit window:
a) Thermal overload
b) Underload
c) Jam
d) Current imbalance
e) Stall
f) Phase loss
7) Current Monitoring Functions:
a) Individual Phase currents
b) Average current
c) Full load current
d) Current to Gound
e) Current imbalance percent
f) Percent thermal capacity utilized
8) Diagnostic Information:
a) Device status
b) Warning status
c) Time to reset
d) Trip status
e) Time to overload trip
f) History of last five trips

b. The electronic overload relay is to be an **Allen-Bradley E300**, or equal.
c. The module shall be wired as shown on the drawings. If additional I/O is required, when shown on the drawings, it shall utilize a an expansion module having four inputs and two outputs. This module shall be **Allen-Bradley E300 Cat No. 193-EXP-DIO-42-120** or **193-EXP-DIO-42-24D** depending on the voltage required

F. Programming of Parameters
1. All parameters may be left at the factory default setting.

G. Testing
1. The interwired Ethernet/IP MCC shall be powered up, configured, and tested in an ISO9001 facility to ensure each unit communicates properly prior to shipment.

2.10 SWITCHBOARD MATTING

A. Where called for on the drawings, Switchboard matting shall be high-voltage, 1/4-inch thick, 36 inches deep, the full width of the MCC, and shall be Model M36 as manufactured by **W.H. Salisbury & Co.**, or equal.

2.11 FACTORY TESTS

A. All motor control centers and their components shall be given manufacturer's standard electrical and mechanical production tests and inspections. The tests shall include electrical continuity check, dielectric tests for each circuit, and inspection for proper functioning of all components, including controls, protective devices, metering, and alarm devices.

2.12 SPARE PARTS

A. The CONTRACTOR shall furnish the following for each MCC:
1. Three bezels of each color installed for pilot indicators
2. One dozen panel lamps
3. One dozen control fuses of each size installed

B. Spare parts shall be identified by MCC number, type, size, and manufacturer.

2.13 MANUFACTURERS, OR EQUAL

A. Motor control centers shall be **Allen-Bradley "Centerline 2100,"** or equal.

PART 3 - EXECUTION

3.1 GENERAL

A. The CONTRACTOR shall install motor control centers in accordance with manufacturer's published instructions. Conduit installation shall be coordinated with manufacturer's as-fabricated drawings so that all conduit stub-ups are within the area allotted for conduit. Conduit shall be stubbed up in the section that contains the devices to which conductors are terminated.

B. The CONTRACTOR shall install motor control centers in place of existing motor control centers while maintaining continued facility operation.

C. The CONTRACTOR shall install new conductors from the service to the MCC and from the automatic transfer switch to the MCC, unless otherwise noted on the drawings.

D. If stored at the Site, motor control centers shall be stored in a clean, dry space. Factory wrapping shall be maintained or an additional heavy plastic cover shall be provided to protect units from dirt, water, construction debris, and traffic. Storage space shall be heated or MCC space heaters shall be energized.

E. Motor control centers shall be handled carefully to avoid damage to motor control center components, enclosure, and finish. Damage shall be repaired before installation.

3.2 INSTALLATION

A. Motor control centers shall be installed on the existing 3-1/2-inch concrete pads. The CONTRACTOR shall be responsible for providing the additions to concrete pads where called for on the Plans or required by manufacturer’s installation requirements. Any existing pads are either to be removed or integrated into the new pad. No exposed concrete “lip” is to be left that presents a safety hazard. After leveling and shimming, the CONTRACTOR shall anchor motor control centers to concrete pads, and shall grout so that no space exists between the pad and support beams.

B. The CONTRACTOR shall:
   1. Torque all bus bar bolts to manufacturer's recommendations. Tighten all sheet metal and structure assembly bolts.
   2. Adjust all Motor Circuit Protector (MCP) devices to the instantaneous trip setting position recommended for the actual horsepower and full load amps of the motor. Verify that overload devices are proper for equipment installed; make necessary changes in overload devices as required for motors having power factor correcting capacitors. This work shall be coordinated with requirements of Specification Section 26 05 73 – Protective Device Study.
   3. After equipment is installed, touch up scratches and verify that nameplate, and other identification is accurate.
   4. Provide high voltage switchboard matting in front of the MCC.

3.3 FIELD TESTS

A. Visual and mechanical inspection after installation
   1. Inspect for physical damage, proper anchorage, and grounding.
   2. Verify that the ratings of the thermal overload heaters match the motor full-load current nameplate data.
   3. Check tightness of bolted connections.

B. Electrical Tests
   1. Insulation tests
      a. Measure insulation resistance of each bus section phase to phase and phase to ground for 1 minute. Test voltage and minimum acceptable resistance shall be in accordance with manufacturer's recommendations. Submit manufacturer's testing recommendations to the ENGINEER prior to performing tests.
      b. Measure insulation resistance of each starter section phase to phase and phase to ground with the starter contacts closed and the protective device open. Test voltage and minimum acceptable resistance shall be in accordance with the manufacturer's recommendations.
      c. Measure insulation resistance of each control circuit with respect to ground.
      d. Record all readings and include in the Operating and Maintenance manual.
   2. Undertake phase sequence test to verify phasing.
   3. Verify proper operation of control logic in all modes of control.

3.4 STARTUP / FINAL

1. Contractor shall provide a Factory Representative for Startup of all of the assemblies within the MCC. Representative will work with all related trades to provide a coordinated control and power distribution system
2. After system has had any repairs/modification completed, Contractor shall clean all debris in the MCC and repair / touch up any cosmetic damage.

END OF SECTION 26 24 19

SECTION 26 29 23 – VARIABLE FREQUENCY DRIVE UNITS

PART 1 - GENERAL

1.1 THE REQUIREMENT

A. General: The CONTRACTOR shall provide variable frequency drive (VFD) units, complete and operable, in accordance with the Contract Documents. It is the intent of this Section to require complete, reliable, fully tested variable frequency drive systems suitable for attended or unattended operation.

B. The requirements of Section 26 05 00 – Electrical Work, General, and Section 26 24 19 – Low Voltage Motor Control Centers, apply to the WORK of this Section.

C. Single Manufacturer: Like products shall be the end product of one manufacturer in order to standardize appearance, operation, maintenance, spare parts, and manufacturer's services. This requirement, however, does not relieve the CONTRACTOR of overall responsibility for the WORK.

1.2 CONTRACTOR SUBMITTALS

A. Furnish submittals in accordance with MASS Section 10.05 Article 5.6.

B. Shop Drawings: Shop Drawings shall include the following information:
   1. Equipment information
      a. Name of drive manufacturer
      b. Type and model with complete catalog number and explanation
      c. Assembly drawing and nomenclature
      d. Maximum heat dissipation capacity in kW
   2. Enclosure rating.
   3. Operator interface information
   4. Conduit entrance provisions.
   5. Circuit breaker type and rating requirements.
   6. UL listing.

C. The Technical Manual shall contain the following documentation:
   1. Manufacturer's 2 year warranty.
   2. Field test report.
   3. Programming procedure and program settings.

D. Spare Parts List: Information for parts required by this Section plus any other spare parts recommended by the controller manufacturer.

PART 2 - PRODUCTS

2.1 GENERAL

A. The CONTRACTOR shall provide variable frequency drives for the following centrifugal pumps:

Facility	Equipment	Enclosure	Pump HP	Drawing
Pump Station 12	Pump 1	NEMA 1	200	E1.1
Pump Station 12	Pump 2	NEMA 1	200	E1.1
Pump Station 12	Pump 3	NEMA 1	200	E1.1
Pump Station 12	Pump 4	NEMA 1	200	E1.1

B. The CONTRACTOR shall provide variable frequency drives as shown on the Drawings.

2.2 EQUIPMENT

A. VFD
   1. Shall be an adjustable frequency inverters
      a. designed to operate at 480V 3 phase, 60 Hertz power to a DC voltage and then to adjustable frequency 3-phase AC by use of a 3 phase inverter as shown on the drawings.
      b. The inverter shall be a voltage source design producing a pulse-width-modulated type output.
      c. Inverters shall be designed to operate 3-phase, 60 Hertz, NEMA-B, open drip-proof (1.15 SF) or TEFC (1.15 SF), squirrel-cage high efficiency inverter duty induction motors over the range of 50-100 percent of base speed without derating (other than for single phase source) or requiring any motor modifications.
      d. Inverters shall be capable of delivering nameplate horsepower exclusive of service factor without the need for mandatory thermostats or feedback tachometers.
      e. The VFD shall vary both the AC voltage and frequency simultaneously to operate the motor at required speeds.
      f. Current source inverters will not be acceptable.
      g. Inverters shall be sized to match the KVA and inrush characteristics of the motors.
   2. The CONTRACTOR shall be responsible for matching the controller to the load (variable torque) as well as the speed and current of the actual motor being controlled.

B. NEMA 4X Enclosure: Not used.

C. NEMA 1 Enclosure: Drives shall be mounted within a NEMA 1 motor control center.

D. The minimum VFD inverter efficiency shall be 95 percent at 100 percent speed and load, and 85 percent at 50 percent speed and load.

E. The VFD shall shut down in an orderly manner when a power outage occurs on one or more phases. Upon restoration of power and a "start" signal, the motor shall restart and run at based on the VFD programmed pumping sequence. See the control narrative on the Drawings for additional information.

F. The VFD shall be provided with additional features described below:
   1. Inrush current adjustment between 50 and 110 percent of motor full load current (factory set at 100 percent).
   2. Overload capability at 110 percent for 60 seconds for variable torque loads.
   3. Adjustable acceleration and deceleration.
   4. On loss of input signal, the VFD shall operate at a preset speed or hold last state at time of signal loss. The intent is for the VFD to enter a programmed ramp down sequence during a loss of input signal.
   5. A minimum of 2 selectable frequency jump points to avoid critical resonance frequency of the driven system.
   6. 3 percent line reactor on the output when indicated on the drawings.

G. Protection: The VFD shall have, as a minimum, the following protection features:
   1. Input line protection provided with metal oxide varistor (MOV) and RC network.
   2. Protection against single phasing.
   3. Instantaneous overcurrent protection.
   4. Electronic overcurrent protection.
   5. Ground fault protection.
   6. Overtemperature protection for electronics.
   7. Protection against internal faults.
   8. Ability to start into rotating motor (forward or reverse rotation).
   9. Additional protection and control as indicated and as required by the motor and driven equipment.

H. Service Conditions: The VFD shall be designed and constructed to satisfactorily operate within the following service conditions.
   1. Ambient temperature: 0 to 40 degrees C
   2. Humidity: 0 to 95 percent, non-condensing
   3. AC line voltage variation: plus 10 percent to minus 10 percent.
   4. AC line frequency variation: plus and minus 2 hertz.

I. Operator Interface: The drive shall have an operator interface with LCD display and full numeric keypad. The operator interface shall be accessible from the front of the enclosure without opening any doors.

J. Ethernet/IP Interface: The inverter signal circuits shall be isolated from the power circuits and be designed to accept a Ethernet/IP interface. The drive automatically communicate with Allen-Bradley programming software to address the drive upon Ethernet/IP connection. The inverter shall follow the setting of a local control when in the hand mode. The following operator monitoring and control devices for the inverter shall be provided on the face of the VFD enclosure, either as discrete devices, or as part of a multi-function microprocessor-based keypad access device. Access to set-up and protective adjustments shall be protected by key-lockout or password.
   1. All available programming parameters must be addressable from Logix5000 over the Ethernet/IP netowrk without the use of protocol convertors or bridges.
   2. Auto/Hand selection from the operator interface. In "Auto", the inverter shall operate from the Ethernet/IP input, and in "Hand" control, shall operate on ethernet/IP from the local keypad.
   3. Speed indicator calibrated in percent speed
   4. Inverter fault trip indication and output alarm contacts
   5. Trip reset pushbutton
   6. Electronic overload protection.

K. Properly identified screw type terminal boards shall be provided for interconnection to remote controls. Factory wiring to terminal boards shall be provided.

L. I/O Option Module: The CONTRACTOR shall provide a 24vdc I/O Module with the following features:
   1. Compatible with the VFD specified herein
   2. Two (2) analog inputs
   3. Two (2) analog outputs
   4. Six (6) discrete inputs
   5. Two (2) relay outputs
   6. No jumpers or switches shall be required to configure the digital inputs and outputs
   7. I/O Options Modules shall be **Allen-Bradley PF750 24V I/O Module Cat No. 20-750-2262C-2R**
   8. I/O Option Module shall be factory wired to a terminal strip within the VFD/MCC enclosure for field wiring to remote devices.

M. Power Terminal Guard: The CONTRACTOR shall provide **Allen-Bradley Power Terminal Guard Cat No. 20-750-PTG1-F6** for additional protection of VFD power terminals.

2.3 POWER CONDITIONING

A. Where shown on the drawings the CONTRACTOR shall provide:
   1. Line Reactor: Line reactors shall be designed for use as output filters for AC-PWM VFDs. The windings shall be copper with 600VAC Class H insulation, bobbin construction, laminated iron core, and rated for 200 percent capacity for 3 minutes. The reactors shall be enclosed in a NEMA 1 enclosure and include wire

terminals, and be UL-listed. The reactors shall be **Trans-Coil Inc. Model KLR**, or equal.

2. Load Reactors
   a. For lead lengths less than 100 feet **TransCoil Inc. Model KDR**
   b. For Lead Lengths 100feet and over **TransCoil Inc. Model V1K**

2.4 SPARE PARTS

A. The CONTRACTOR shall furnish the spare parts listed below, suitably packaged and labeled with the corresponding equipment number.

B. The following spare parts shall be furnished:
   1. Three (3) sets of spare fuses of each size.
   2. One (1) spare keypad access device (HIM).
   3. The OWNER currently has spare parts for Allen-Bradley VFD units. Unless the CONTRACTOR is providing Allen-Bradley VFD units, the CONTRACTOR shall provide 10% spares of the VFD units installed under this Contract and at least one (1) VFD of each size.

2.5 MANUFACTURERS

A. The variable frequency drive units shall be **Allen-Bradley Powerflex 755**, or equal.

B. Panel size is based on Allen-Bradley drives. CONTRACTOR shall make all necessary modifications required for other drives.

PART 3 - EXECUTION

3.1 SERVICES OF MANUFACTURER

A. General: An authorized service representative of the manufacturer shall be present at the site as necessary to furnish the inspection, startup, and field adjustment services listed below.

B. Inspection, Startup, Field Adjustment: The authorized service representative shall supervise the following and certify the equipment and controls have been properly installed, aligned, and readied for operation.
   1. Installation of the equipment
   2. Inspection, checking, and adjusting the equipment
   3. Startup and field testing for proper operation
   4. Performing field adjustments such that the equipment installation and operation comply with requirements.

C. Instruction of OWNER's Personnel: The authorized representative shall instruct the OWNER's personnel in the operation and maintenance of the equipment, including

step by step troubleshooting with test equipment. Instruction shall be specific to the VFD models provided.

D. Telephone Support: The drive Manufacturer shall provide one (1) year of telephone technical support for the Owner during normal business hours. The technical support shall include the drive, HIM, and Ethernet/IP network, and shall start on the date of substantial completion.

3.2 INSTALLATION

A. Conduit stub-ups for interconnected cables and remote cables shall be located and terminated in accordance with the drive manufacturer's recommendation.

B. The CONTRACTOR shall perform programming of drive parameters required for proper operation of the VFD's included in this project. Submit records of programming data in the equipment Technical Manual, including setup and protective settings

3.3 FIELD TESTING

A. Testing, checkout, and startup of the VFD equipment in the field shall be performed under the technical direction of the manufacturer's service engineer. Under no circumstances shall any portion of the drive system be energized without authorization from the manufacturer's representative.

END OF SECTION 26 29 23

SECTION 26 33 05 – DC POWER SUPPLY/BATTERY CHARGER

PART 1 - GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall provide the single-phase heavy-duty industrial battery charger and all accessories required, complete and operable, in accordance with the Contract Documents.

B. The requirements of Section 26 05 00 – Electrical Work, General, apply to the WORK of this Section.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. The charger is to be designed and built in accordance with UL 1012, the general requirements of NEMA PE-5 and best commercial practice for industrial and utility grade rectifier/chargers. Models marked “UL listed” are to be listed to UL 1012.

1.3 CONTRACTOR SUBMITTALS

A. Furnish Shop Drawings and catalog data in accordance with MASS Section 10.05 Article 5.6. Submit sufficient information to indicate the scope and quality of the battery charger installation.
   1. Equipment arrangement, outlet devices, and special mounting details.
   2. Wiring diagrams showing terminal identification for field-installed wiring.
   3. Catalog literature.

1.4 QUALITY ASSURANCE

A. Industrial battery charger system components shall be manufactured by firms that are regularly engaged in the production of such systems, including auxiliary equipment similar to that required by this Contract, and that have been in satisfactory service for at least 10 years.

PART 2 - PRODUCTS

2.1 SCADA PANEL DC POWER SUPPLY/BATTERY CHARGER

A. Charger Description
   1. Charger is to be a fully regulated, constant voltage, current limited unit designed for heavy-duty industrial service and be capable of full rated output over its entire specified operating envelope. Charger is to be capable of recharging a fully discharged VRLA, flooded lead-acid or nickel cadmium battery while powering a parallel connected load.

2. Charger topology is to be single phase, full wave, SCR type with a current limiting and single or two-stage output LC filter to provide low ripple DC.

B. Charger Operation and Application: The charger is to provide fully automated recharge and maintenance of the system battery. The charger shall automatically determine the need for boost (high rate) charging based on the battery's state of charge. A standard temperature compensation system is to automatically adjust charge voltage based on ambient temperature.

C. Safety Isolation: Electrical isolation from input AC mains to output DC is to be maintained through the use of power transformers that meet the isolation requirements of UL 1012. Transformers are to be de-rated to operate within UL specified temperature limits.

D. AC Mains Supply
1. The charger is to be designed to operate from 120-volt ± 10%, 60 Hz ± 5%, AC mains.

E. Output
1. Output Voltage Rating and Adjustment: 24 volts DC nominal. The float voltage is to be adjustable from 100% of nominal to 120% of nominal (24 volts to 28.8 volts). Boost voltage is to be adjustable up to 15% above float voltage.
2. Battery Compatibility: The standard output voltage is to be compatible with (i.e., the charger will meet all its published specifications) the following battery configurations:

		Lead-acid	
	VRLA	Flooded	Ni-Cd
Cells	11-12	11-12	17-19

3. Float/Boost/Automatic Mode Control: Two modes of voltage operation are to be provided, float mode and boost mode (also known as "equalize".) A three-position selector switch is to allow manual selection of float mode or boost mode. The third position is to place the charger in automatic boost mode. Automatic boost mode is to cause the charger to operate in boost mode only when the current demanded exceeds about 70% of the charger's maximum rated current. When the current demand drops to about 50% of the charger's rating the charger is to resume float mode operation where it is to remain until the next high demand from the battery.
4. Output Current Limit: The current limit is to be of the rectangular type (full current is to be available regardless of load) to prevent overstress of charger components. Current limit is to provide protection from overload and output short circuit. Current limit is to be factory set at between 100% and 105% of rated output current. Current limit is to be adjustable up to 110% of rated output.
5. Output Regulation: The static output voltage regulation in float mode is to be +1% of the correct temperature compensated voltage from no load to full load for rated AC input.
   a. Output Voltage Temperature Compensation: The charger's output voltage is to be temperature compensated to minus 0.18% per degree Celsius. The temperature compensation curve is to be linear until +10 degrees C, below

which the output voltage is to stop increasing. Battery temperature sensing is to be accomplished by a sensor located on the control card.

6. Output Stability: The charger is to operate in a stable condition when driving a DC load either with parallel connected battery or without battery.
7. Output Ripple: To be less than 30-mV rms when connected to a battery rated in ampere-hours four times the charger's output ampere rating, the ripple without battery is to be less than 100-mV rms.
8. Voltage Sensing Point: Voltage sense is to be at the output terminals of the charger.

F. Protection
   1. Surge Suppression – AC Input: MOV surge suppression is to be fitted to the secondary side of the input isolation transformer.
   2. Surge Suppression – DC Output: The output filter is to have high value inductance and capacitance to provide robust protection against high-energy transients.
   3. Input Overcurrent Protection Device is to be provided by a thermal magnetic two-pole circuit breaker with UL-listed amp interrupting rating of 10,000 amps at 240 volts AC, 60 Hz.
   4. Output Overcurrent Protective Device is to be provided by a thermal magnetic two pole circuit breaker with UL-listed interrupting rating of 5,000 amps at 48 volts DC.
   5. High Voltage Shutdown (HVS): HVS is to activates if the output voltage exceeds a preset value. After shutdown, the charger is to restart after the battery voltage drops below nominal. HVS is to deactivate the SCR drive.

G. Status Indicators and Alarms
   1. AC On Indicator: A green LED is to indicate that an AC main is present, and that the input breaker is turned on.
   2. AC Fail Indicator and Alarm: A red LED and a Form C contact, double-pole, double-throw (DPDT) is to indicate that the AC power has failed, or that the AC input breaker is open.
   3. Low Battery Voltage Indicator and Alarm: A red LED and a Form C contact (DPDT) is to indicate that the battery voltage has dropped below an adjustable threshold. There is to be a delay of approximately 20 seconds after onset of the alarm condition and activation of the relay contact.
   4. High Battery Voltage Indicator and Alarm: A red LED and a Form C (DPDT) contact is to indicate that the battery voltage has risen above an adjustable threshold.
   5. Charge Fail Indicator and Alarm: A red LED and a Form C contact (DPDT) is to indicate that the charger is not producing the current demanded by the battery and/or load. This alarm is to activate when the AC has failed or when a charger malfunction has occurred. This alarm is to be based on measured output current. If there is current demanded but no output produced, the alarm is to be activated. The alarm must not activate if no current is demanded, thus preventing false alarms.

6. High Volt Shutdown Indicator and Alarm: A red LED and a Form C contact (DPDT) is to indicate when the charger has shut down due to excessive output voltage.
7. Summary Alarm: A Form C (DPDT) contact is to operate if any alarm condition except high voltage shutdown has occurred.
8. Remote Contact Ratings: One set of Form C remote contacts is to be provided for each alarm. Contacts are to be non-latching, and automatically reset after the fault condition ends. Contact rating is to be 2A @ 26 VDC or 0.5A @117 VAC.
9. DC Voltmeter: A precision DC meter of 3.5" width, with 2% accuracy is to be provided to indicate charger output voltage.
10. DC Ammeter: A precision DC meter of 3.5" width, with 2% accuracy is to be provided to indicate charger output current.

H. Controls and Adjustments
   1. Controls
      a. 2-pole AC input breaker
      b. 2-pole DC output breaker
      c. Output charge mode
      d. Alarm LED test
   2. All controls are to be accessible with the front door closed

I. Environmental Requirement
   1. Ambient
      a. Temperature: -20C to +50C
      b. Humidity: 5% to 95%, non-condensing
      c. Altitude: 0-10,000 ft; no derating
   2. Cooling: Convection cooled.

J. Mechanical
   1. Installation: The unit is to be designed for installation on a wall or bulkhead, or in a 19" relay rack. A maximum of 12 inches of free space above and 6 inches below the unit is required for proper flow of cooling air.
   2. Cabinet Type: NEMA-1.
   3. Power Connections: Input and output connections are to be made direct to the input and output DC circuit breaker compression terminals.
   4. Alarm Connections: All alarm connections are to be made to compression terminals inside the charger. The wire size for all connections is to be #14 AWG.
   5. Housing material is to be 0.125" 5052 H32 aluminum, heavy clear anodized.
   6. Metal Finish: Corrosion protection is to be inherent in the metal plating.

2.2 STANDARD NAMEPLATE DATA

A. A standard permanent adhesive nameplate is to contain the following data:
   1. Supplier name, city and state
   2. Product description
   3. Model number

4. Serial number/date code
5. Input voltage rating
6. Input frequency rating
7. Input current rating
8. Nominal output voltage rating
9. Output current rating

2.3 DRAWINGS AND DOCUMENTS

A. A final test report is to be supplied with each charger. In addition, one user manual per charger is to be supplied that contains the information described below. Drawings and documents are to reflect the manufacturer's standard, cataloged product.

B. Documents and drawings are to be created to good commercial practice, and are to be supplied on standard 11" x 17" paper, or on 8.5" x 11" paper.

C. The user is to provide:
1. Safety instructions
2. Product description
3. Mechanical installation instructions, with drawings
4. AC input ratings and terminal configurations
5. Electrical connections
6. Operation instructions with explanation of operating modes and controls
7. Output adjustments, along with standard factory settings and description and chart of temperature compensation operation
8. Troubleshooting table
9. Component diagnostic tests
10. Detailed theories of operation for all circuits

D. The following drawings are to be appended to user manual:
1. Detailed dimensional drawing
2. Connections drawing, with maximum wire sizes shown
3. Power circuit schematic
4. Control board schematic, with component values
5. Alarm board schematic, with component values

2.4 QUALITY ASSURANCE, INSPECTION AND TEST

A. Quality Assurance: The following quality assurance steps are to be included in the manufacturer's standard procedure:
1. Source control documents are maintained on all purchased parts
2. A master list of all approved purchased components and vendors is maintained
3. All assembly personnel are trained in the manufacture of the product

4. Bills of material, drawings, procedures, photographs, visual method sheets and other documents affecting the manufacture and test of the product are controlled so that engineering changes are immediately incorporated.
5. Inspection is performed at every step of the assembly process. (Quality is "built-in" rather than "inspected in.")

B. Standard Factory Assembly and Test Procedure: The standard assembly process is to prescribe the tests and calibration that are to be performed on the product. These activities are to include, but are not limited to, the following:
1. Insulation breakdown test using a "hipot" device to the standards prescribed in UL 1012.
2. Performance testing to insure that critical performance specifications are met. These are to include operation at low and high AC line voltage, output ripple and regulation.
3. Calibration to the correct output, alarm and shutdown voltages

2.5 WARRANTY

A. The manufacturer is to warrant its products to be free of defects in material or workmanship for a period of two years from date of shipment.

2.6 MANUFACTURERS, OR EQUAL

A. Full-size: SCADA panel DC power supply/battery chargers shall be **SENS model Q 024-025-T-L-511-C**, or equal.

B. Provide the following DC power supplies/battery chargers:

Facility	Full-size	Compact
Pump Station 12	UPS	

2.7 BATTERY PROVISION

A. Each SCADA panel DC power supply/battery charger is to be connected to a 24 V sealed lead acid battery rated at 103Ah at the 10-hour rate. Batteries are to be (2) units of the **Powersonic Battery model PS-121100**, or equal.

B. The batteries are to be provided with a proprietary wall mounting bracket that is rated for MOA seismic zone requirements.

PART 3 - EXECUTION

3.1 GENERAL

A. The industrial battery charger system shall be installed as indicated and shall conform to Section 26 05 00 – Electrical Work, General, and the equipment manufacturer's installation instructions.

B. The CONTRACTOR shall receive, store, and assemble all sections of the battery charger system to form complete units. The CONTRACTOR shall make all internal wiring interconnections as required for complete assembly of the system. Where wiring connectors are not supplied by the manufacturer, the CONTRACTOR shall furnish the connectors required to complete internal wiring terminations.

C. The CONTRACTOR shall take all necessary precautions to eliminate moisture and foreign material from the equipment at all times during storage and installation. Special care shall be taken to prevent corrosion of and damage to the battery charger system.

END OF SECTION 26 33 05

SECTION 26 35 26 – HARMONIC FILTERS

PART 1 - GENERAL

1.1 THE REQUIREMENT

A. Provide design and engineering, labor, material, equipment, related services, and supervision required, including, but not limited to, manufacturing, fabrication, erection, and installation for low voltage active harmonic filters (AHF) as required for the complete performance of the work, as herein specified.

B. The work specified in this Section includes the characteristics for a continuous duty Active Harmonic Filter (AHF) designed to reduce total demand distortion (TDD and total harmonic distortion (THD (V)) to levels less than 5%. The AHF will also be able to correct for linear displacement and to balance the incoming three-phase current.

1.2 REFERENCES, CODES, AND STANDARDS

A. The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only. The edition/revision of the referenced publications shall be the latest date as of the date of the Contract Documents, unless otherwise specified.

B. **Institute of Electrical and Electronics Engineers, Inc. (IEEE):**
1. ANSI/IEEE 519-2014, "Guide for Harmonic Control in Electrical Power Systems."
2. ANSI/IEEE C62.41-1991, “Guide for Surge Voltages in Low AC Power Circuits”

C. **Underwriters Laboratories, Inc. (UL):**
1. UL 508, "Standard for Industrial Control Equipment."

1.3 SYSTEM DESCRIPTION

A. **Performance Requirements:**
1. General: The AHF shall incorporate a state of the art IGBT based inverter to draw energy from the line at some portion(s) of the 60 Hz cycle, store the energy at the capacitor bank of the system DC buss, and then deliver the stored energy at some other portion(s) of the cycle. The AHF will utilize digital signal processor technology to continuously monitor the incoming line current and instantaneously direct energy/current flow in and out of the inverter to effectively correct: harmonic distortion, linear phase displacement and to balance the incoming three-phase lines.
   a. Limit the 2nd through the 51st order harmonic current to less than 5% TDD at each AHF installation point.

b. Limit the voltage distortion THD (V) added to the facility electrical system to less than or equal to 5% immediately to the line side of each AHF installation point
c. Power Factor: Near unity at each AHF installation point.
d. Three-Phase line current balancing: ± 3% each AHF installation point.
e. Crest Factor Capability: 3.0

B. **Environmental Service Conditions**
1. Ambient Operation Temperature: 0º C to 40º C
2. Humidity: 0 to 95%, non-condensing
3. Altitude: Operate up to 3280 ft without derating

1.4 SUBMITTALS

A. **Action Submittals**
1. Technical Brochure detailing the features of the AHF
2. Dimensional drawings with the size, installed weight, and heat dissipation for each size AHF provided
3. Installation wiring diagram for each AHF provided

1.5 QUALITY ASSURANCE

A. **Third Party Certification:** The AHF shall have the third party certification by Underwriters Laboratories (UL listing, USL, and CNL)

B. **Manufacturer Qualifications:** The manufacturer shall have been engaged in the production of low voltage active harmonic filters of the types and sizes required for a minimum of 10 years.

1.6 DELIVERY, STORAGE, AND HANDLING

A. The AHF is to be delivered to the project site in the supplier's or manufacturer's original containers, labeled with the supplier's or manufacturer's name or product brand name

B. Store AHF and accompanying materials in their original, undamaged packages and containers, inside a well-ventilated area, which is protected from weather, moisture, extreme temperatures, and humidity.

C. Storage Temperature: -20º C to 60º C

1.7 PROJECT CONDITIONS

A. **Environmental Requirements:** Prior to the installation of AHF ensure that workplace is weatherproof, environmental conditions are within specifications for the AHF, and all significant in the area of the AHF is completed.

1.8 WARRANTY

A. **General:** Standard Factory Warranty shall be at least 18 months from the date of shipment, or one year from the verified date of startup, whichever comes first. This warranty covers defects in material and workmanship.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. **Basis of Design:** The AHF specified shall be manufactured by Mesta Electronics, Inc. This specification is to establish a standard of quality for the design, function, materials, and appearance of the systems. Equivalents products by other manufacturers are acceptable.

B. **Acceptable Manufacturers**
1. Mesta Electronics, Inc.
2. “Approved” Equal

2.2 EQUIPMENT SIZE & RATINGS

A. Active harmonic filter (AHF) shall be designed to operate from an input voltage of 480 VAC, +12%, -15%, 3phase, 3 wire plus ground.

B. AHF shall be designed to operate with a voltage frequency of 60 Hz, ±5 Hz.

C. AHF efficiency shall be no less than 98% at full load with heat losses not exceeding more than 2% of the unit KVAR rating.

D. AHF amperage output shall be 200 amperes.

E. AHF shall include a door interlocked disconnect switch. The disconnect switch shall be lockable in the off position.

F. AHF output shall be electronically current limited to 100% rms of system current rating.

G. Fuses will provide redundant overload protection. Fuses shall be Class T rated at 200,000 AIC.

2.3 ACTIVE HARMONIC FILTER SYSTEM

A. **Enclosure:**
1. AHF shall be provided in a NEMA Type 1 gasketed enclosure with air intake filters
2. Enclosed AHF systems rated for 50 amps through 200 amps shall be supplied in wall mountable enclosures with top or bottom cable entry. Each enclosed

wall mountable system shall include a door interlocked disconnect switch, which is lockable in the off position, and lifting lugs to aid in installation

B. **Function of AHF**

1. In order to monitor the incoming line current the AHF will utilize two current sensors mounted on phases A and B of the incoming line. A third current sensor shall be utilized on phase C if there are line to neutral single phase loads present on the load side of the system installation point. Scaling for different size current sensors will be programmable via the HMI remote interface and LCD touch screen.
    a. The AHF shall inject the corrective current required to limit the 2nd through the 51st order harmonic current to less than 5% TDD at each AHF installation point as defined by ANSI/IEEE Standard 519-2014.
    b. The AHF shall limit the voltage distortion THD (V) added to the facility electrical system to less than or equal to 5% immediately to the line side of each AHF installation point as defined in ANSI/IEEE Standard 519-2014.
    c. Non-linear loads installed downstream of the AHF shall be equipped with line reactors rated for a minimum of 3% **or** have DC link chokes rated for a minimum of 4%. Both are **not** required.
    d. The AHF will also have the capability to provide reactive current correction, and load balancing of the three phase lines. These functions will be field selectable via the HMI.
2. The AHF shall use electronic current limiting technology for protection of the system in the case of an overload condition.
    a. In the case of an overload condition the AHF will electronically current limit its output to 100% rms of the system maximum current capacity.
    b. The AHF will be designed to operate continuously while current limited at 100% rms of maximum capacity.
3. The AHF shall be equipped with a Standby/Power Saving function which will automatically disable the AHF inverter when the monitored load power drops below a user selected, pre-programmed level.
    a. This function can be used for power savings, or to automatically disable the AHF when an alternate input (emergency) source is being utilized which does not require harmonic correction.
    b. During the Standby/Power Saving mode the AHF inverter bridge will remained energized in order to prevent any time delay when the AHF is automatically re-enabled.
4. The AHF shall enable the user to select the desired harmonic current TDD% to be achieved.
    a. This function can be accessed via the LCD front screen
5. The AHF shall enable the user to select the desired Power Factor to be achieved.
    a. This function can be accessed via the LCD front screen
6. In the case of a shutdown due to AC line conditions, the system will be programmed to restart in a controlled manner once the AC conditions are within system specifications.

a. The AHF shall be able to record the last 1,856 reset events that include line occurrences and/or fault conditions. The AHF will have a battery backup memory feature that will enable the unit to store the reset event information in the event of a power failure, or if the unit is manually turned off.
   (i) Reset event information shall include a message stating the reason for the shutdown and/or fault, which is date and time stamped

7. In the case of shutdown due to a fault condition, the AHF will be programmed to attempt an auto restart and resume normal operation.
   a. If the AHF completes the preprogrammed number of restarts and the fault condition still exists then the system will not attempt to restart until the system is attended to manually.
   b. The AHF shall be able to record the last 480 shutdown events that include AC line occurrences and/or fault conditions. The AHF will have a battery backup memory feature that will enable the unit to store shutdown event information in the event of a power failure, or if the unit is manually turned off.
      (i) Shutdown event information shall include a message stating the reason for the shutdown and/or fault, which is date and time stamped, as well as RMS, and instantaneous, values for:
         1. AC line voltages
         2. AC line currents
         3. Load currents
         4. AHF currents
         5. AHF inverter currents
         6. DC buss voltage
         7. Heat sink temperatures
         8. PC board temperatures
   c. The AHF shall be able to record FDR (oscilloscope) data for the last 100 shutdown events, which allows for the customer or manufacturer to plot data from the last 4 cycles. The AHF will have a battery backup memory feature that will enable the unit to store shutdown event information in the event of a power failure, or if the unit is manually turned off.
      (i) FDR Data information shall include a message stating the reason for the shutdown and/or fault, which is date and time stamped, as well as values for:
         1. AC line voltages
         2. AC line currents
         3. Load currents
         4. AHF currents
         5. AHF inverter currents

C. **Customer Interface**
   1. Front Panel Interface
      a. AHF shall incorporate 6” x 3.5” dust tight graphic color LCD touch screen display
      b. The AHF LCD touch screen display shall enable the user to view detailed power quality information, before and after the system installation point, so

that the end user can evaluate the effectiveness of the system. This detailed information shall include, but not be limited to, the following:
(i) Line Voltage
(ii) Line Frequency
(iii) Line current (amps) before and after AHF installation point
(iv) Line THD % before and after AHF installation point
(v) Harmonic current (amps) before and after AHF installation point
(vi) Line Kilowatts (KW), Kilovolt amperes (KVA), and Power Factor (PF) before and after AHF installation point.

c. The operating status of the AHF ("ON" or "OFF) shall be indicated towards the bottom of the LCD touch screen display on every operational display page.
d. Additional status information such as: normal operation, max. Load, reduced power factor mode, low AC line, and warning or diagnostic messages shall be displayed directly below the "ON" or "OFF" status information.
e. Miscellaneous AHF operating parameters shall also be viewable on the LCD touch screen display. These parameters shall include: system heat sink temperature, system PC board temperature, AHF currents, AHF % loading, AHF inverter currents, Internal DC buss voltage, and system internal supply voltages.
f. The LCD touch screen display shall enable the user to perform the following system functions by touching the appropriate icons.
(i) Run
(ii) Stop
(iii) Menu (select)
(iv) Set Parameters
g. The LCD touchscreen shall enable the user to view detailed historical data. This detailed information shall include, but not be limited to, the following:
(i) Most recent 480 shutdown records that include AC line occurrences and/or fault conditions
(ii) Most recent 1856 reset records that include AC line occurrences and/or fault conditions
(iii) FDR information shall include a message stating the reason for the shutdown and/or fault, which is date and time stamped, as well as values for:
1. AC line voltages
2. AC line currents
3. Load currents
4. AHF currents
5. AHF inverter currents
h. The AHF shall enable the user to save status history and FDR data to a flash drive from the front panel interface for data acquisition and troubleshooting.
(i) Status history information includes shall include a message stating the reason for the shutdown and/or fault, which is date and time stamped, as well as RMS, and instantaneous, values including:

1. AC line voltages
2. AC line currents
3. Load currents
4. AHF currents
5. AHF inverter currents
6. DC buss voltage
7. Heat sink temperatures
8. PC board temperatures
9. Parameter data
10. Most recent 480 shutdown records that include AC line occurrences and/or fault conditions
11. Most recent 1856 reset records that include AC line occurrences and/or fault conditions

(ii) FDR information shall include a message stating the reason for the shutdown and/or fault, which is date and time stamped, as well as values for:

1. AC line voltages
2. AC line currents
3. Load currents
4. AHF currents
5. AHF inverter currents

i. The AHF shall enable the user to update firmware from the front panel interface with the use of a flash drive. (No computer or additional protocols required)

j. The AHF shall have LED indicators on the front panel that clearly show the customer the following status information in case of LCD screen issues
(i) Power
(ii) Control Status
(iii) Power Status

2. **Ethernet Communications Interface**

a. The AHF shall have ethernet communications interface that can be accessed at the system front panel.

b. The AHF ethernet interface shall enable the user to configure the selectable system parameters, collect system diagnostic information, collect current system operational data, collect historical system operational data, and remotely enable or disable the system.

c. The AHF ethernet interface shall also enable the user to collect detailed power quality information, before and after the system installation point, so that the end user can evaluate the effectiveness of the system. This detailed information shall include, but not be limited to, the following:
(i) Line Voltage
(ii) Line Frequency
(iii) Line current (amps) before and after system installation point
(iv) Line TDD % before and after system installation point
(v) Harmonic current (amps) before and after system installation point
(vi) Line Kilowatts (KW), Kilovolt amperes (KVA), and Power Factor (PF) before and after system installation point.

d. The AHF ethernet interface shall also enable the user to collect and view detailed status history information, including:
   (i) Current parameter information
   (ii) Most recent 480 shutdown records that include AC line occurrences and/or fault conditions
   (iii) Most recent 1,856 reset records that include AC line occurrences and/or fault conditions
   (iv) Most recent 100 FDR records that include a message stating the reason for the shutdown and/or fault, which is date and time stamped, as well as values for:
      1. AC line voltages
      2. AC line currents
      3. Load currents
      4. AHF currents
      5. AHF inverter currents

e. An optional Ethernet/IP module shall be provided.

3. **Status Contacts**
   a. The AHF shall be equipped with three status relays for remote monitoring of the system. The relay contacts shall be rated for 1.0 amps @ 24 VDC or 0.5 amps @ 125 VAC. The first relay will be energized if the system is fully operational and correcting harmonics. The second relay will be energized if a diagnostic or warning condition is indicated. The third relay will be energized if the system is operating at maximum capacity.
4. **Remote Enable/Disable Dry Contact Input**
   a. The AHF shall be equipped with a remote enable/disable input which can be controlled by a dry contact or a switch. This feature will permit the operator to remotely enable or disable the system without having to utilize the serial, or Ethernet communications interface.

2.4 EXTERNAL CURRENT TRANSFORMERS

A. AHF shall utilize two split core type current transformers mounted on the phases A and B to monitor the line current drawn by the load(s).
B. AHF shall be equipped with a CT setup function which can automatically determine if the external currents transformers are installed on the correct phase and in the correct direction and alert the user of improper CT placement. Automatic correction for improper CT placement will also be possible.
C. Current Transformers shall be rated at a minimum for the total rated rms current of the load at the system installation point and shall have an output of current of 5 amperes.
D. Current Transformers rated for 400 Hz shall be used

2.5 SOURCE QUALITY CONTROL

A. The manufacturer shall fully test the performance of the AHF at full current and voltage, while functioning as a harmonic correction system to assure compliance

with equipment specifications herein. The AHF shall be factory tested under steady state and varying load conditions.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Preparation and installation of the AHF shall be in accordance with reviewed product data, final shop drawings, and manufacturer's written recommendations.
   1. Install low voltage active harmonic filters in accordance with the NEC and applicable local codes.
   2. Contractor shall submit a plan for review to the ENGINEER in preparation for installation of the AHF.

3.2 FIELD QUALITY CONTROL

A. Field inspection startup and testing shall be performed by a qualified technician from the manufacturer.

B. Perform equipment startup and testing in accordance with the manufacturer's instruction manual.

C. Document equipment nameplate information and startup/testing data on the manufacturer's recommended startup/test report.

END OF SECTION 26 35 26

SECTION 26 36 23 – AUTOMATIC TRANSFER SWITCH

PART 1 - GENERAL

1.1 THE REQUIREMENT

A. Furnish and install automatic transfer switches (ATS) with number of poles, amperage, voltage, withstand and close-on ratings as shown on the plans. Each automatic transfer switch shall consist of an inherently double throw power transfer switch mechanism and a microprocessor controller to provide automatic operation. All transfer switches and controllers shall be the products of the same manufacturer.

1.2 CODES AND STANDARDS

A. The automatic transfer switches and controls shall conform to the requirements of:
   1. UL 1008 - Standard for Transfer Switch Equipment
   2. NFPA 70 - National Electrical Code
   3. NFPA 110 - Emergency and Standby Power Systems
   4. IEEE Standard 446 - IEEE Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications
   5. NEMA Standard ICS10-1993 (formerly ICS2-447) - AC Automatic Transfer Switches
   6. UL 508 Industrial Control Equipment

PART 2 - PRODUCTS

2.1 MECHANICALLY HELD TRANSFER SWITCH

A. The transfer switch shall be electrically operated and mechanically held. The electrical operator shall be a momentarily energized, single-solenoid mechanism. Main operators which include overcurrent disconnect devices, linear motors or gears shall not be acceptable. The switch shall be mechanically interlocked to ensure only two possible positions, normal or emergency.

B. The switch shall be positively locked and unaffected by momentary outages. All main contacts shall be silver composition. Inspection of all contacts shall be possible from the front of the switch without disassembly of operating linkages and without disconnection of power conductors.

C. Designs utilizing components of molded-case circuit breakers, contactors, or parts thereof, which are not intended for continuous duty, repetitive switching or transfer between two active power sources, are not acceptable.

2.2 MICROPROCESSOR CONTROLLER

A. The controller's sensing and logic shall be provided by a single built-in microprocessor.

B. A single controller shall provide twelve selectable nominal voltages. Voltage sensing shall be true RMS type and shall be accurate to ± 1% of nominal voltage. Frequency sensing shall be accurate to ± 0.2%. The panel shall be capable of operating over a temperature range of -20 to +60 degrees F and storage from -55 to +85 degrees F.

C. The controller shall be connected to the transfer switch by an interconnecting wiring harness. The harness shall include a keyed disconnect plug to enable the controller to be disconnected from the transfer switch for routine maintenance. Interfacing relays shall be industrial grade plug-in type with dust covers. The panel shall be enclosed with a protective cover and be mounted separately from the transfer switch unit.

D. All customer connections shall be wired to a common terminal block to simplify field-wiring connections.

E. The controller shall meet or exceed the requirements for Electromagnetic Compatibility (EMC) as follows:

1. EN 55011:1991 Emission standard - Group 1, Class A

2. EN 50082-2:1995 Generic immunity standard, from which:

EN 61000-4-2:1995	Electrostatic discharge (ESD) immunity
ENV 50140:1993	Radiated Electro-Magnetic field immunity
EN 61000-4-4:1995	Electrical fast transient (EFT) immunity
EN 61000-4-5:1995	Surge transient immunity
EN 61000-4-6:1996	Conducted Radio-Frequency field immunity

3. IEEE472 (ANSI C37.90A) Ring Wave Test.

2.3 ENCLOSURE

A. The ATS shall be furnished with a NEMA 1 rated, lockable, dead front enclosure unless otherwise shown on the Contract Drawings.

B. There are no penetrations allowed in door.

2.4 CONTROLLER DISPLAY AND KEYPAD

A. A four line, 20 character LCD display and keypad shall be an integral part of the controller for viewing all available data and setting desired operational parameters.

2.5 VOLTAGE, FREQUENCY AND PHASE ROTATION SENSING

A. Voltage and frequency on both the normal and emergency sources (as noted below) shall be continuously monitored, with the following pickup, dropout, and trip setting capabilities (values shown as % of nominal):

Parameter	Sources	Dropout / Trip	Pickup / Reset
Undervoltage	N&E,3ϕ	70 to 98%	85 to 100%
Overvoltage	N&E,3ϕ	102 to 115%	2% below trip
Underfrequency	N&E	85 to 98%	90 to 100%
Overfrequency	N&E	102 to 110%	2% below trip
Voltage unbalance	N&E	5 to 20%	1% below dropout

B. Voltage and frequency settings shall be field adjustable in 1% increments either locally with the display and keypad or remotely via serial communications port access.

C. The controller shall be capable of sensing the phase rotation of both the normal and emergency sources. The source shall be considered unacceptable if the phase rotation is not the preferred rotation selected (ABC or CBA).

D. Source status screens shall be provided for both normal and emergency to provide digital readout of voltage on all 3 phases, frequency, and phase rotation.

2.6 TIME DELAYS

A. An adjustable time delay of 0 to 6 seconds shall be provided to override momentary normal source outages and delay all transfer and engine starting signals.

B. A time delay shall be provided on transfer to emergency, adjustable from 0 to 60 minutes, for controlled timing of transfer of loads to emergency.

C. Two time delay modes (which are independently adjustable) shall be provided on re-transfer to normal. One time delay shall be for actual normal power failures and the other for the test mode function. The time delays shall be adjustable from 0 to 60 minutes. Time delay shall be automatically bypassed if the emergency source fails and the normal source is acceptable.

D. A time delay shall be provided on shut down of engine generator for cool down, adjustable from 0 to 60 minutes.

E. All time delays shall be adjustable in 1 second increments using the LCD display and keypad.

2.7 ADDITIONAL FEATURES

A. A SPDT contact, rated 5 amps at 30 VDC, shall be provided for a low-voltage engine start signal. The start signal shall prevent dry cranking of the engine by requiring the generator set to reach proper output, and run for the duration of the cool down setting, regardless of whether the normal source restores before the load is transferred.

B. Auxiliary contacts, rated 10 amps, 250 VAC shall be provided consisting of one contact, closed when the ATS is connected to the normal source and one contact closed, when the ATS is connected to the emergency source. Additional auxiliary contacts shall be provided where required and as shown on the Plans.

C. LED indicating lights shall be provided; one to indicate when the ATS is connected to the normal source (green) and one to indicate when the ATS is connected to the emergency source (red).

D. LED indicating lights shall be provided and energized by controller outputs. The lights shall provide true source availability of the normal and emergency sources, as determined by the voltage sensing trip and reset settings for each source.

E. An inphase monitor shall be provided in the controller. The monitor shall control transfer so that motor load inrush currents do not exceed normal starting currents, and shall not require external control of power sources. The inphase monitor shall be specifically designed for and be the product of the ATS manufacturer.

F. The controller shall be capable of accepting a normally open contact that will allow the transfer switch to function in a non-automatic mode using an external control device.

G. Self Diagnostics: The controller shall contain a diagnostic screen for the purpose of detecting system errors. This screen shall provide information on the status input signals to the controller which may be preventing load transfer commands from being completed.

H. Communications Interface: The controller shall be capable of interfacing through an Ethernet/IP interface and an optional serial communication module.

I. Data Logging: The controller shall have the ability to log time and date stamped data and to maintain the last 99 events in the event of total power loss, including:
   1. Event Logging
      a. Data and time and reason for transfer normal to emergency.
      b. Data and time and reason for transfer emergency to normal.
      c. Data and time and reason for engine start.
      d. Data and time engine stopped.
      e. Data and time emergency source available.
      f. Data and time emergency source not available.
   2. Statistical Data

a. Total number of transfers.
b. Total number of transfers due to source failure.
c. Total number of days controller is energized.
d. Total number of hours both normal and emergency sources are available.

2.8 WITHSTAND AND CLOSING RATINGS

A. The ATS shall be rated to close on and withstand the available RMS symmetrical short circuit current at the ATS terminals with the type of overcurrent protection shown on the plans. This requirement shall be coordinated with the requirements of Section 26 05 73 – Protective Device Study.

B. The ATS shall be UL listed in accordance with UL 1008 and be labeled in accordance with that standard's 1½ and 3 cycle, long-time ratings.

2.9 ACCEPTABLE MANUFACTURERS

A. Automatic transfer switches shall be **ASCO 7000 Series**, or equal.

2.10 DEVICES

A. Provide the following transfer switches:

Facility	Description	ATS Part Number
Pump Station 12	480V, three-phase, three-wire	

PART 3 - EXECUTION

3.1 TESTS AND CERTIFICATION

A. The complete ATS shall be factory tested to ensure proper operation of the individual components and correct overall sequence of operation and to ensure that the operating transfer time, voltage, frequency and time delay settings are in compliance with the specification requirements.

B. The ATS manufacturer shall be certified to ISO 9001 International Quality Standard and the manufacturer shall have third party certification verifying quality assurance in design/development, production, installation and servicing in accordance with ISO 9001.

END OF SECTION 26 36 23

SECTION 26 43 13 – SURGE PROTECTION FOR LOW VOLTAGE ELECTRICAL POWER CIRCUITS

PART 1 GENERAL

1.01 SUMMARY

A. Scope: Provide labor, material, equipment, related services, and supervision required, including, but not limited to, manufacturing, fabrication, erection, and installation for surge protection for low voltage electrical power circuits as required for the complete performance of the work, and as shown on the Drawings and as herein specified.

B. Section Includes: The work specified in this Section includes, but shall not be limited to, the following:

1. Requirements for integrated SPDs (installed from the factory) for low voltage power

1.02 REFERENCES

A. General: The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only. The edition/revision of the referenced publications shall be the latest date as of the date of the Contract Documents, unless otherwise specified.

B. Institute of Electrical and Electronics Engineers, Inc. (IEEE):

1. ANSI/IEEE C62.41.1, “Guide on the Surges Environment in Low Voltage (1000 V and Less) AC Power Circuits.”
2. ANSI/IEEE C62.41.2, “Recommended Practice on Characterization of Surges in Low Voltage (1000 V and Less) AC Power Circuits.”
3. ANSI/IEEE C62.45, “Guide on Surge Testing for Equipment Connected to Low Voltage AC Power Circuits.”

C. International Organization for Standardization (ISO):

1. ISO 9001, "Quality Management Systems - Requirements."

D. National Fire Protection Association (NFPA):

1. NFPA 70, "National Electrical Code," hereinafter referred to as NEC.

E. Underwriters Laboratories, Inc. (UL):

1. UL 67, "Standard for Panelboards."
2. UL 96A, "Standard for Installation Requirements for Lightning Protection Systems."
3. UL 845, "Motor Control Centers."
4. UL 857, "Busways."
5. UL 891, "Switchboards."
6. UL 1283, “Standard for Safety for Electromagnetic Interference Filters."
7. UL 1449, "Standard for Surge Protective Devices."

8. UL 1558, "Standard for Metal-Enclosed Low-Voltage Power Circuit Breaker Switchgear."

1.03 DEFINITIONS

A. $I_{(n)}$: Nominal discharge current rating.

B. MCOV: Maximum continuous operating voltage.

C. Protection Modes: The pair of electrical connections where the VPR applies.

D. MOV: Metal oxide varistor; an electronic component with a significant non-ohmic current voltage characteristic.

E. OCPD: Overcurrent protective device.

F. SCCR: Short circuit current rating.

G. SPD: Surge protective device.

H. VPR: Voltage protection rating.

1.04 SYSTEM DESCRIPTION

A. General SPD Requirements:

1. SPD with accessories shall be listed and labeled as defined in NEC, by UL, and marked for intended location and application.

2. Comply with UL 1449.

3. Comply with UL 1283 (applies to Type 2 SPDs).

4. Design in accordance with ANSI/IEEE C62.41.1, ANSI/IEEE C62.41.2, and ANSI/IEEE C62.45.

5. SPDs manufacturer shall be ISO 9001 certified.

6. MCOV of the SPD shall not be less than 115 percent for 480Y/277V and 125 percent for 240/120V nominal RMS system voltages.

7. SPDs installed internal to the distribution equipment shall be of the same manufacturer as the equipment. The equipment shall be fully tested and certified to the following UL standards:

a. Panelboards: UL 67.

b. Motor Control Centers: UL 845.

c. Busway: UL 857.

d. Switchboards: UL 891.

e. Switchgear: UL 1558.

1.05 SUBMITTALS

A. General: See Section 01 33 00 – Contractor Submittals.

B. Product Data: Submit product data showing material proposed. Submit sufficient information to determine compliance with the Drawings and Specifications.

1. For each type of product indicated include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

2. Provide verification the SPD is listed or recognized through UL to the latest safety standard, UL 1449.

C. Shop Drawings: Submit shop drawings for each product and accessory required. Include information not fully detailed in manufacturer's standard product data.

D. Operation and Maintenance Data: Submit operation and maintenance data for surge protection for low voltage electrical power circuits to include in operation and maintenance manuals.

E. Warranty Data: Submit sample of special warranties.

1.06 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer Qualifications: Manufacturer shall be a firm engaged in the manufacture of surge protection for low voltage electrical power circuits of types and sizes required, and whose products have been in satisfactory use in similar service for a minimum of five years.

2. Installer Qualifications: Installer shall be a firm that shall have a minimum of five years of successful installation experience with projects utilizing surge protection for low voltage electrical power circuits similar in type and scope to that required for this Project and shall be approved by the manufacturer.

B. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances, and regulations of Federal, State, and local authorities having jurisdiction. Obtain necessary approvals from such authorities.

C. Single Source Responsibility: Obtain surge protection for low voltage electrical power circuits and required accessories from a single source with resources to produce products of consistent quality in appearance and physical properties without delaying the work. Any materials which are not produced by the manufacturer shall be acceptable to and approved by the manufacturer.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the Project site in supplier's or manufacturer's original wrappings and containers, labeled with supplier's or manufacturer's name, material or product brand name, and lot number, if any.

B. Store materials in their original, undamaged packages and containers, inside a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1.08 WARRANTY

A. Special Warranty: Submit a written warranty executed by the manufacturer, the Installer, and the Contractor, agreeing to repair or replace surge protection for low voltage electrical power circuits that fail in materials or workmanship within the specified warranty period.

1. Warranty Period: Warranty period shall be 10 years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: Product specified is “Surgelogic Surge Protection” as manufactured by Square D by Schneider Electric. Items specified are to establish a standard of quality for design, function, materials, and appearance. Equivalent products by other manufacturers are acceptable. The Engineer will be the sole judge of the basis of what is equivalent.

2.02 SERVICE ENTRANCE SUPPRESSORS

A. SPDs: Comply with UL 1449.

1. SPDs installed on the line side of the service entrance OCPD shall be Type 1 SPDs. SPDs installed on the load side of the service entrance OCPD shall be either Type 1 or Type 2 SPDs.

2. Type 2 SPDs shall also comply with UL 1283.

B. Features and Accessories: SPDs shall provide the following features and accessories:

1. Internal fusing design capable of disconnecting the SPD before any damaging external effects to the suppressor or surroundings occur.

2. Indicator light(s) display for power and protection status with push-to-test capabilities.

3. Audible alarm with silencing switch.

4. Form C contacts; one normally open and one normally closed for remote monitoring of protection status. Contacts shall reverse on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.

5. Surge counter with reset switch.

6. Optional integral disconnect switch for externally mounted SPDs. SPDs integrated into factory supplied equipment shall have an input disconnect switch or circuit breaker unless indicated on the equipment drawings/data sheets.

C. Surge Current Rating: The surge current rating of the SPD shall be dependent of its category/location, as follows:

Category/Location	Application	Per Phase	Per Mode
C	Service Entrance	240 kA	120 kA
B	Distribution	160 kA	80 kA

D. Protection Modes:

1. UL 1449 VPR for grounded WYE configured circuits shall not exceed the following:

Modes	208Y/120	480Y/277	600Y/347
L-N; L-G; N-G	800 volts	1200 volts	1500 volts

L-L	1200 volts	2000 volts	2500 volts

2. UL 1449 VPR for Delta configured circuits shall not exceed the following:

Modes	240D	480D	600D
L-G; N-G	1200 volts	2000 volts	2500 volts

E. SCCR: Per NEC 285.6, the short circuit current rating of the SPD shall be equal to or greater than the available short circuit current at the point on the system where installed.

F. Nominal Discharge Current Rating: 20 kA $I_{(n)}$.

1. Surge protective devices located at service entrance locations shall carry a minimum nominal discharge current rating of 20 kA to meet the requirements of UL 96A.

2.03 DISTRIBUTION/ BRANCH PANEL SUPPRESSORS

A. SPDs: Comply with UL 1449.

1. Type 1 or Type 2 SPDs.

2. Type 2 SPDs shall also comply with UL 1283.

B. Features and Accessories: SPDs shall provide the following features and accessories:

1. Internal fusing design capable of disconnecting the SPD before any damaging external effects to the suppressor or surroundings occur.

2. Indicator light(s) display for power and protection status.

3. Audible alarm with silencing switch.

4. Form C contacts; one normally open and one normally closed for remote monitoring of protection status. Contacts shall reverse on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.

5. Surge counter with reset switch.

6. Optional integral disconnect switch for externally mounted SPDs. SPDs integrated into factory supplied equipment shall have an input disconnect switch or circuit breaker unless indicated on the equipment drawings/data sheets.

C. Surge Current Rating: The surge current rating of the SPD shall be dependent of its category/location, as follows:

Category/Location	Application	Per Phase	Per Mode
B	Distribution	160 kA	80 kA
B	Branch	120 kA	60 kA

D. Protection Modes:

1. UL 1449 VPR for grounded WYE configured circuits shall not exceed the following:

Modes	208Y/120	480Y/277	600Y/347
L-N; L-G; N-G	800 volts	1200 volts	1500 volts
L-L	1200 volts	2000 volts	2500 volts

2. UL 1449 VPR for Delta configured circuits shall not exceed the following:

Modes	240D	480D	600D
L-G; N-G	1200 volts	2000 volts	2500 volts

E. SCCR: Per NEC 285.6, the short circuit current rating of the SPD shall be equal to or greater than the available short circuit current at the point on the system where installed.

F. Nominal Discharge Current Rating: 10 kA $I_{(n)}$.

2.04 ENCLOSURES

A. Enclosure shall meet or exceed the ratings for the environment to be installed as indicated on drawings.

1. Indoor Enclosures for Externally Mounted SPDs: NEMA 250, Type 3R.

2. Outdoor Enclosures for Externally Mounted SPDs: NEMA 250, Type 3R, 4X.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine areas and conditions under which the work is to be installed, and notify the Contractor in writing, with a copy to the Owner and the Engineer, of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

1. Beginning of the work shall indicate acceptance of the areas and conditions as satisfactory by the Installer.

3.02 INSTALLATION

A. Install surge protection for low voltage electrical power circuits in accordance with reviewed product data, final shop drawings, manufacturer's written instructions and recommendations, and as indicated on the Drawings.

B. Install SPD devices at the service entrance in accordance with NEC. SPDs installed on the line side of the service entrance OCPD shall be Type 1 SPDs. SPDs installed on the load side of the OCPD shall be either Type 1 or Type 2 SPDs.

C. Follow manufacturer's recommended installation practices.

1. Provide a minimum 30 ampere circuit breaker as a dedicated disconnecting means for the SPD unless otherwise indicated.
2. Install SPDs with properly rated conductors between suppressor and points of attachment as short and straight as possible; adjust circuit breaker positions to achieve shortest and straightest leads.
3. Do not splice and extend SPD leads unless specifically permitted by manufacturer.
4. Twist input conductors together to reduce the input inductance.

3.03 FIELD QUALITY CONTROL

A. See Section 01 45 00 - Quality Control.

B. Perform the following tests and inspections.

1. Compare equipment nameplate data for compliance with the Drawings and the Specifications.
2. Inspect anchorage, alignment, grounding, and clearances.
3. Verify that electrical wiring installation complies with manufacturer's written installation requirements.

C. A SPD will be considered defective if it does not pass inspections.

D. Prepare inspection reports.

3.04 DEMONSTRATION

A. Start-Up Service:

1. Complete start-up checks according to manufacturer's written instructions.
2. Do not perform insulation resistance tests of the distribution wiring equipment with SPDs installed. Disconnect all wires, including, but not limited to, neutral of the SPD before conducting insulation resistance tests, and reconnect them immediately after the testing is over.
3. Energize SPDs after power system has been energized, stabilized, and tested.

3.05 PROTECTION

A. Provide final protection and maintain conditions in a manner acceptable to the Installer that shall ensure that the surge protection for low voltage electrical power circuits shall be without damage at time of Substantial Completion.

END OF SECTION

SECTION 40 05 07 – HANGERS AND SUPPORTS FOR PROCESS PIPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Hangers and Supports including:
   1. Metal pipe hangers and supports.
   2. Trapeze pipe hangers.
   3. Metal framing systems.
   4. Fastener systems.
   5. Pipe positioning systems.
   6. Equipment supports.
   7. Seismic equipment restraints.

1.2 RELATED SECTIONS

A. Municipality of Anchorage Standard Specifications (MASS), Special Provisions and Division 1 -General Requirements apply to Work of this Section.

B. 01 11 00 – Summary of Work

C. 01 33 00 – Submittal Procedures

D. 01 75 00 – Starting and Adjusting

E. 09 90 00 – Painting and Coating

F. 40 05 07 – Hangers and Supports for Process Piping

G. 40 05 53 – Process Valves

H. 40 23 40 – Sanitary Wastewater Process Piping

I. 43 23 00 – Dry Location Liquid Pumps

1.3 REFERENCES

A. ASME B31.1 -Power Piping.

B. ASME B31.5 -Refrigeration Piping.

C. ASME B31.9 -Building Services Piping.

D. ASTM A 36 -Standard Specification for Carbon Structural Steel.

E. ASTM A 780 -Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

F. MSS SP 58 -Pipe Hangers and Supports -Materials, Design and Manufacturer.

G. MSS SP 69 -Pipe Hangers and Supports -Selection and Application.

H. MSS SP 89 -Pipe Hangers and Supports -Fabrication and Installation Practices.

I. MSS -Manufacturers Standardization Society of the Valve and Fittings Industry Inc.

1.4 DESIGN / PERFORMANCE REQUIREMENTS

A. General: Except as otherwise indicated, provide factory fabricated piping hangers and supports. Select size of hangers and supports to exactly fit pipe size for bare piping, and to exactly fit around piping insulation with saddle or shield for insulated piping.

B. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated in accordance with ASCE/SEI 7.

1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight and thrust loads of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
3. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

1.5 SUBMITTALS

A. Prepare, deliver, and process under provisions of Section 01 33 00, SUBMITTAL PROCEDURES. Requests for proposed substitute or “or-equal” equipment/systems/products will be considered in accordance with the provisions of paragraph “Substitute and “Or-Equal” Products”.

B. Complete list of all deviations from the Drawings and Specifications.

C. Product Data: Manufacturer's data sheets on each product including components to be used, including:

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

D. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following:

1. Trapeze pipe hangers.
2. Pipe stands.
3. Equipment supports.

E. Welding certificates.

F. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

G. Closeout Submittals: Provide manufacturer's instructions that include recommendations for compliance with specifications.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing Products specified in this section with minimum 3 years documented experience.

B. Installer Qualifications: Company specializing in performing Work of this section with minimum 3 years documented experience.

C. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code -Steel."

D. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labeled with manufacturer's identification.

B. Store products in manufacturer's unopened packaging until ready for installation.

C. Protect from weather and construction traffic, dirt, water, chemical, and mechanical damage.

1.8 SEQUENCING

A. Ensure that locating templates and other information required for installation of products of this section are furnished to affected trades in time to prevent interruption of construction progress.

B. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.9 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: B-Line Systems, Inc.; Grinnell Corp., Unistrut, or equal. Substitutions: Not permitted.

2.2 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Standard: Comply with MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer of the following.
    a. Carbon steel.
3. Metallic Coating:
    a. Hot-dipped galvanized.
4. Nonmetallic Coatings: Plastic coating, jacket, or liner.
5. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.

2.3 TRAPEZE PIPE HANGERS

A. Trapeze Type: MSS SP-69, Type 59, shop or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and washers. Total load of piping components imposed on trapeze spans shall not exceed manufacturer's design load rating. Load calculation and detail of each unit shall include a safety factor of 2 times the expected load.

2.4 METAL FRAMING SYSTEMS

A. Metal Framing Systems: Shop or field-fabricated pipe-support assembly made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.

1. Standard: Comply with MFMA-4.
2. Channels: Continuous slotted steel channel with in-turned lips.

3. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
4. Hanger Rods: Continuous-thread rod, nuts, and washer made of
    a. Carbon steel.
5. Metallic Coating:
    a. Hot-dipped galvanized after fabrication

2.5 FASTENERS

A. Mechanical-Expansion Anchors: Insert-wedge-type, metal anchors, for use in hardened Portland cement concrete; with pullout, tension, and shear capacities appropriate for supported loads and building materials where used. Anchors shall be:
    1. Zinc-coated steel.

2.6 ACCESSORY PRODUCTS

A. Vertical Mid-Span Piping Supports: For use with vertically installed water, waste, vent, air, medical gas and fuel gas pipe, NPS 4 (DN 100) and smaller, for a distance exceeding 48 inches (1.2 m).

B. Abrasion-Protection Isolators: Use for prevention of damage to tubes and piping caused by abrasion when passing through or in contact with studs, joists, and similar framing.

2.7 ACOUSTICAL NOISE AND VIBRATION ISOLATION

A. Acoustical Isolation System: Consisting of through-stud isolators, pipe clamps, riser clamp pads, neoprene and felt lining material and associated support brackets. For applications requiring acoustical isolation of tubing, piping, and equipment from structure.

2.8 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A36/A36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and packaged, dry, hydraulic-cement, non-shrink and non-metallic grout; suitable for interior and exterior applications.
    1. Properties: Non-staining, noncorrosive, and nongaseous.
    2. Design Mix: 5,000 psi (34.5-MPa), 28 day compressive strength.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate is the responsibility of another installer, notify Architect of unsatisfactory conditions before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Obtain permission from Architect before using powder-actuated anchors.

C. Do not drill or cut structural members.

D. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 HANGER AND SUPPORT INSTALLATION

A. Support of piping and equipment by means of engineered products designed for each application. Comply with manufacturer's design load capacities. Makeshift, field-devised methods such as use of scrap materials, plumber's tape, tie wires and similar methods are not permitted.

B. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

C. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.

2. For applications not suited to, or exceeding the capacity of manufactured supports, field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected and designed for loads being supported. Weld steel according to AWS D1.1/D1.1M.

D. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.

E. Fastener System Installation:

1. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

F. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture with the use of manufactured products, designed for each specific application. Makeshift, field-devised, methods shall not be employed.

G. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories with the use of manufactured products, designed for each specific application. Makeshift, field-devised, methods shall not be employed.

H. Equipment Support Installation: Use manufactured equipment supports designed for and recommended by manufacturer for specific applications. Comply with manufacturers rated load capacities. For applications not suited to, or exceeding the capacity of manufactured supports, fabricate supports from welded-structural-steel shapes designed for the equipment to be supported.

I. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

J. Install lateral bracing with pipe hangers and supports to prevent swaying.

K. Install pipe in compliance with all pipe and fitting manufacturers' installation instructions.

L. Building Attachments:

1. Within concrete slabs or attached to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers in accordance with NPS 2-1/2 (DN 65) and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

2. For overhead pipe NPS 1 (DN 25) and smaller, use cast-in-place anchors specified.

M. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

N. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

O. Isolate piping systems from building structure to minimize noise transfer by using acoustical suspension isolator silencer and bracket system.

P. Protect tubing and piping from damage caused by abrasion when passing through studs, joists, and similar framing using abrasion protection isolators.

Q. Prevent damage to piping and tubing caused by contact between dissimilar metals using insert system designed specifically for this application.

3.4 EQUIPMENT SUPPORTS

A. Use manufactured equipment supports designed for and recommended by manufacturer for specific applications. Comply with manufacturer's rated load capacities. For applications not suited to, or exceeding, the capacity of manufactured supports, fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.5 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.6 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to minimum of 1-1/2 inches (40 mm).

3.7 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils (0.05 mm).

B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Section 09 90 00 – Painting and Coating.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A780.

3.8 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

3.9 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use carbon-steel for general service applications.

E. Use stainless steel or fiberglass corrosion-resistant attachments for hostile environment applications.

F. Use padded hangers for piping that is subject to scratching.

G. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of non-insulated or insulated, stationary pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
2. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
3. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36 (DN 100 to DN 900), with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
4. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36 (DN 100 to DN 900), with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.

5. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 (DN 65 to DN 900) if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.

6. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30 (DN 25 to DN 750), from two rods if longitudinal movement caused by expansion and contraction might occur.

7. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24 (DN 65 to DN 600), from single rod if horizontal movement caused by expansion and contraction might occur.

8. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 (DN 50 to DN 1050) if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.

9. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 (DN 50 to DN 600) if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.

10. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 (DN 50 to DN 750) if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

H. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24 (DN 24 to DN 600).

2. Carbon-or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 (DN 20 to DN 600) if longer ends are required for riser clamps.

I. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches (150 mm) for heavy loads.

2. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.

J. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.

2. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.

3. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.

4. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.

5. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
6. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
7. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
8. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
9. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
10. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
    a. Light (MSS Type 31): 750 lb. (340 kg).
    b. Medium (MSS Type 32): 1500 lb. (680 kg).
    c. Heavy (MSS Type 33): 3000 lb. (1360 kg).

K. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

L. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

M. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION

SECTION 40 05 53 – PROCESS VALVES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish, install, and verify the function of valves, operators, and accessories as specified herein and as shown on the Drawings.

1.2 RELATED SECTIONS

A. Municipality of Anchorage Standard Specifications (MASS), Special Provisions, and Division 1 -General Requirements apply to Work of this Section.

B. 01 11 00 --Work Summary

C. 01 33 00 – Submittal Procedures

D. 01 75 00 – Starting and Adjusting

E. 09 90 00 – Painting and Coating

F. Division 26 – Electrical

G. 40 05 07 – Hangers and Supports For Process Piping

H. 40 23 40 – Sanitary Wastewater Process Piping

I. 43 23 00 – Dry Location Liquid Pumps

1.3 QUALITY ASSURANCE

A. Reference: American Society for Testing and Materials (ASTM).

B. American National Standards Institute (ANSI);

C. American Society of Mechanical Engineers (ASME)

D. American Water Works Association (AWWA)

1.4 SUBMITTALS

A. Prepare, deliver, and process under provisions of Section 01 33 00, SUBMITTAL PROCEDURES. Requests for proposed substitute or “or-equal” equipment/systems/products will be considered in accordance with the provisions of paragraph “Substitute and “Or-Equal” Products”.

B. Complete list of all deviations from the Drawings and Specifications.

C. Shop Drawings. Provide the following:

1. Product data sheets for make and model.
2. Complete catalog information, descriptive literature, specifications, and identification of materials of construction, including headloss characteristics, operating torque, and operational requirements of each valve.
3. Information on equipment field erection requirements including weight of assembled components and weight of each subassembly.
4. A maintenance schedule showing the required maintenance, frequency of maintenance, lubricants and other items required at each regular preventative maintenance period.
5. Factory finish systems.
6. Special shipping, storage and protection and handling instructions.
7. Information on equipment field erection requirements including weight of assembled components, weight of each subassembly and critical dimensions, fasteners and anchors.
8. Manufacturer's printed installation instructions for all assemblies and subassemblies.

D. Quality Control. Provide the following:

1. Functional test and results of performance confirmation checks
2. Operation and Maintenance Manuals: Include:
    a. Manufacturers recommended spare parts and special tools.
    b. Maintenance schedule showing the required maintenance, frequency of maintenance, and other items required at each regular preventative maintenance period.
3. Manufacturer's Certificate of Proper Installation and Operation.
    a. The Manufacturer shall provide written certification to Contractor for submittal to the Owner and Engineer that the equipment has been correctly installed and is operating properly.
    b. The Manufacturer shall submit to Contractor for submittal to the Owner and Engineer, results of testing performed and required by this specification.
    c. Manufacturer's Certificate of Training: The Manufacturer will provide a list of signatures of operators who have completed the training requirements of this section.

1.5 MANUFACTURERS' SERVICES

A. A manufacturer's representative for items specified herein shall be present at the job for one (1) trip of two (2) days duration (not including travel time), for installation

assistance, verification of installation, inspection, functional and performance testing, start-up and job-site training.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Flanges: Securely attach metal, hardboard, or wood protectors over entire gasket surface.

B. Gaskets: Store gaskets in cool, dry, well-ventilated area with no exposure to direct sunlight. Do not allow gasket contact with petroleum products (oil, fuel, and solvents).

C. Threaded or Socket Welding Ends: Fit with metal, wood, or plastic plugs or caps.

D. Cold Weather Storage: Locate products to prevent coating from freezing to ground.

E. Linings and coatings: Protect from damage by heat and excessive drying.

F. Handling: Use heavy canvas or nylon slings to lift pipe and fittings.

PART 2 - PRODUCTS

2.1 GENERAL

A. All valve construction, materials, and pressure ratings shall be selected to suit the system in which installed. Pressure rating and manufacturer's name shall be cast on each valve body. Where specified, valves shall be supplied fully packed with Teflon impregnated packing. Where possible, valves shall be of one manufacturer.

B. CONTRACTOR shall be responsible for coordination of equipment dimensions, installation requirements, weights, and loadings with the listed Manufacturers, and the incorporation of the selected equipment into the dimensional constraints of the building, within the limits of the structural concrete, piping arrangement and of other equipment features as shown on the Drawings.

C. Where shown on the drawings or specified herein, valves are to include factory mounted operator, actuator, handwheel, chain wheel, extension stem, worm and gear operator, operating nut, chain, wrench, and accessories for complete operation.

D. Valves to open by turning counterclockwise.

E. Valve ends to suit adjacent piping.

F. Unless otherwise indicated in the Drawings or specifications, the nominal size of valves to be installed is the same as the nominal diameter of the pipe to which they are connected.

G. The Contract Documents indicate specific required features of the equipment, but do not purport to cover all details of design and construction.

2.2 VALVES

A. SWING CHECK VALVES

1. Scope

   a. This specification covers the design, manufacture, and testing of 2 in. (50 mm) through 48 in. (1200 mm) Swing Check Valves suitable for cold working pressures up to 250 psig (1725 kPa), in wastewater service.

   b. The check valve shall be of the full flow body type, with a domed access cover and only two moving parts, the flexible disc and the Disc leaf spring.

2. Standards and Approvals

   a. The valves shall be designed, manufactured, tested and certified to American Water Works Association Standard ANSI/AWWA C508.

   b. The valves used in potable water service shall be certified to NSF/ANSI 61 Drinking Water System Components – Health Effects, and certified to be Lead-Free in accordance with NSF/ANSI 372.

   c. Manufacturer shall have a quality management system that is certified to ISO 9001 by an accredited, certifying body.

3. Connections

   a. The valves shall have flanges with drilling to ANSI B16.1, Class 125.

4. Design

   a. The valve body shall be full flow equal to nominal pipe diameter at all points through the valve. The 4 in. (100mm) valve shall be capable of passing a 3 in. (75mm) solid. The seating surface shall be on a 45 degree angle to minimize disc travel. A threaded port with pipe plug shall be provided on the bottom of the valve to allow for field installation of a backflow actuator or oil cushion device without special tools or removing the valve from the line.

   b. The top access port shall be full size, allowing removal of the disc without removing the valve from the line. The access cover shall be domed in shape to provide flushing action over the disc for operating in lines containing high solids content. A threaded port with pipe plug shall be provided in the access cover to allow for field installation of a mechanical, disc position indicator.

   c. The disc shall be of one-piece construction, precision molded with an integral O-ring type sealing surface and reinforced with alloy steel. The flex portion of the disc contains nylon reinforcement and shall be warranted for twenty-five years. Non-Slam closing characteristics shall be provided through a short 35 degree disc stroke and a disc accelerator to provide a cracking pressure of 0.3 psig.

   d. The disc accelerator shall be of one piece construction and provide rapid closure of the valve in high head applications. The disc accelerator shall be enclosed within the valve and shall be field adjustable and replaceable without removal of the valve from the line. The disc accelerator shall be securely held in place captured between the cover and disc. It shall be

formed with a large radius to allow smooth movement over the disc surface.

e. The valve disc shall be cycle tested 1,000,000 times in accordance with ANSI/AWWA C508 and show no signs of wear, cracking, or distortion to the valve disc or seat and shall remain drop tight at both high and low pressures.

5. Accessories

a. A screw-type backflow actuator shall be provided to allow opening of the valve during no-flow conditions. Buna-N seals shall be used to seal the stainless steel stem in a Lead-Free bronze bushing. The backflow device shall be of the rising-stem type to indicate position. A stainless steel T-handle shall be provided for ease of operation.The disc shall be precision molded Buna-N (NBR), ASTM D2000-BG. The backflow actuator shall be shortened as necessary in the field to mitigate space constraints

b. A mechanical indicator shall be provided (when specified) to provide disc position indication on valves 3" (80 mm) and larger. The indicator shall have continuous contact with the disc under all operating conditions to assure accurate disc position indication.

c. A pre-wired limit switch will be provided (when specified) to indicate open/closed position to a remote location. The mechanical type limit switch shall be activated by the mechanical indicator. The switch shall be rated for NEMA 4, 6, or 6P and shall have U.L. rated 5 amp, 24Vdc contacts.

6. Manufacturer

a. Manufacturer shall demonstrate a minimum of five (5) years' experience in the manufacture of resilient, flexible disc check valves with hydraulic cushions.

b. All valves shall be hydrostatically tested and seat tested to demonstrate zero leakage. When requested, the manufacturer shall provide test certificates, dimensional drawings, parts list drawings, and operation and maintenance manuals.

c. The exterior and interior of the valve shall be coated with an NSF/ANSI 61 approved fusion bonded epoxy coating.

d. Swing Check Valves shall be Surgebuster® Series #7200 as manufactured by Val-Matic® Valve & Mfg. Corporation, Elmhurst, IL. USA or approved equal.

B. KNIFE GATE VALVES

1. Valve shall be a bonnetless knife gate.

2. Gate edge shall be machined, finished, and rounded and have a 45 degree beveled knife edge. The gate faces shall be finish ground.

3. Exclusive Premium Packing System shall fit a rounded machined packing chamber. The Exclusive Premium Packing System shall consist of multiple layers of packing with anti-extrusion plate. The selected packing system shall be for wastewater service. The packing gland shall match the valve body. The fasteners shall be stainless steel.

4. Body shall be a one piece casting of type 304 stainless steel. Valve body shall incorporate cast in guides and jams and can handle full reverse pressure without damage. Valve inside port diameter shall be equal to ANSI B36.10 STD pipe inside diameter for both metal and resilient seated valves. Raised faces shall be full width per ASME B16.20 standards for spiral-wound gaskets.
5. Seat shall be resilient seated. Resilient seated valves shall have the resilient seat material molded on three sides of the stainless steel seat ring. Resilient seat material shall be Chloroprene suitable for use with low temperature wastewater.
6. Face-to-face dimension shall meet MSS SP-81 for knife gate valves.
7. Cold Working Pressure valve rating shall be 150 psi (1030 kPa) for 2" – 48"
8. Flange drilling shall be in accordance with ANSI B16.5 class 150, 2" - 24"/50mm - 600mm)
9. Actuation Manually actuated valves 14' - 36" (350 - 900mm) shall be supplied with bevel gear actuators with a 12" hand wheel. The bevel gear yoke shall be two piece 304 cast stainless steel. The yoke sleeve shall be aluminum bronze. The stem shall be type 304 stainless steel.
10. Coating 3 mils minimum (non stainless steel parts) Enamel; SP 10 surface prep.
11. Manufacturer; Knife Gate Valves shall be Model KGC-ES Cast Knife Gate Valves as manufactured by DeZurik or approved equal.

C. AUTOMATIC COMBO AIR/VAC VALVE

1. Vacuum Breaker Valve
    a. Application; Suitable for wastewater service. Automatically allow air into the piping to break a vacuum/siphon condition.
    b. Construction; Threaded end, ASTM A536 Grade 65-45-12 ductile iron body, cover and plug, ASTM A48 cast iron baffle, Buna-N seat, stainless steel float, spring and lever.
    c. Pressure rating: 175 psi, minimum.
    d. Manufacturer; DeZurik/APCO. Or approved equal.
        1) APCO Series 401 SAVV, Vacuum Relief -Air Inlet Valve, Model Number 403.
2. Air Release Valve
    a. Application; Suitable for Wastewater service. Automatically release small amounts of air entrapped in piping.
    b. Construction; threaded end, ASTM A536 Grade 65-45-12 ductile iron body and cover; stainless steel linkage, stem and concave float; Buna-N needle.
    c. Pressure Rating: 175 psi, minimum.
    d. Manufacturer: DeZurik/APCO or approved equal:
        1) Sewage Air Release Valve, APCO Series 400 SARV.

3. Combination Air/Vacuum Release Valve

   a. Application; Suitable for Wastewater service. Automatically release air entrapped in piping and alternately, allow air into the pipe to relieve vacuum.

   b. Construction; Dual Body Sewage Combination Air Valve.

      1) 3” threaded end NPT,

      2) Body-ASTM A536 Grade 65-45-12 ductile iron body and cover;

      3) Interior-stainless steel linkage, stem and concave float;

      4) Seating surface-Acrylonitrile-Butadiene (NBR)

      5) Orifice- ¼” orifice, 11-150 psi

      6) 316 Stainless steel pipe/fittings between air/vacuum valve and air release valve.

      7) Back Flush Kit- 600 psi maximum

   c. Pressure Rating: 175 psi, minimum.

   d. Coating: 4GO – 3 mils minimum (non stainless steel parts) of blue enamel on exterior and SP10 surface prep.

   e. Manufacturer: DeZurik/APCO or approved equal:

      1) ASD,2,403C,T1,R14-NBR-POM-S1,X*BFK Modified

2.3 OPERATORS

A. Manual Operator:

   1. Operator force not to exceed 40 pounds under any operating condition, including initial breakaway. Gear reduction operator when force exceeds 40 pounds.

   2. Operator self-locking type or equipped with self-locking device.

   3. Position indicator on quarter-turn valves.

   4. Worm and gear reduction operators one-piece design worm-gears of gear bronze material. Worm hardened alloy steel with thread ground and polished. Traveling nut type operators threaded steel reach rods with internally threaded bronze or ductile iron nut.

2.4 ACCESSORIES

A. Tagging: Provide a 1-1/2-inch diameter brass or stainless steel tag for each valve operator.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that dimensions are correct and project conditions are suitable for installation. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. All valves and gates shall be installed in the manner and location shown on the plans and in strict accordance with manufacturer's recommendations.

B. Valves

1. Flange Ends: Flanged valve bolt holes shall straddle vertical centerline of pipe. Clean flanged faces, insert gasket and bolts, and tighten nuts progressively and uniformly.
2. Screwed Ends: Clean threads by wire brushing or swabbing and apply joint compound.
3. Socket Ends: Clean socket and apply joint primer and cement.

C. Valve Orientation:

1. Install operating stem vertical when valve is installed in horizontal runs of pipe having centerline elevations 4-feet 6-inches or less above finished floor, unless otherwise shown.
2. Install operating stem horizontal in horizontal runs of pipe having centerline elevations between 4-feet 6-inches and 6-feet above finish floor, unless otherwise shown.
3. Locate valve to provide accessibility for control and maintenance.

3.3 TESTS AND INSPECTION

A. Test valves for smooth open and close with operating pressure on one side and atmospheric pressure on the other. Perform test in both directions for valves which are subject to pressure on both sides. Test valves for normal open and close times and rapid close time. Swing Check Valve shall be integrated into the pump control system by factory technician. See specifications for start-up and controls system.

B. Record number of turns to open and close valve; account for any discrepancies with manufacturer's data.

C. Verify and record the set point pressure for relief valves.

D. Inspect and test air release valves as pipe is filled for proper seating, release, and function.

END OF SECTION

SECTION 40 05 60 – SLUICE GATES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The equipment provided under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer unless exceptions are noted by the engineer. Gates and operators shall be supplied with all the necessary parts and accessories indicated on the drawings, specified or otherwise required for a complete and properly operating installation, and shall be the latest standard product of a manufacturer regularly engaged in the production of cast iron water control gates.

B. Unit Responsibility: To ensure compatibility of all components directly related to the sluice gates, the contractor shall assume unit responsibility for the sluice gates, new and existing actuators, and accessories as described in this and related sections. Contractor will be responsible for modifying the two existing Rotork IQFM actuators as necessary to work with the new 36” sluice gates.

1.2 RELATED SECTIONS

A. Municipality of Anchorage Standard Specifications (MASS), Special Provisions, and Division 1 -General Requirements apply to Work of this Section.

B. 01 11 00 --Work Summary

C. 01 33 00 – Submittal Procedures

D. 01 75 00 – Starting and Adjusting

E. 09 90 00 – Painting and Coating

F. Division 26 – Electrical

G. 40 05 07 – Hangers and Supports For Process Piping

H. 40 23 40 – Sanitary Wastewater Process Piping

I. 43 23 00 – Dry Location Liquid Pumps

1.3 QUALITY ASSURANCE

A. Reference: American Society for Testing and Materials (ASTM).

B. American National Standards Institute (ANSI)

C. American Society of Mechanical Engineers (ASME)

D. American Water Works Association (AWWA)

1.4 SUBMITTALS

A. Prepare, deliver, and process under provisions of Section 01 33 00, SUBMITTAL PROCEDURES. Requests for proposed substitute or “or-equal” equipment/systems/products will be considered in accordance with the provisions of paragraph “Substitute and “Or-Equal” Products”.

B. Complete list of all deviations from the Drawings and Specifications.

C. Shop Drawings. Provide the following:

1. Product data sheets for make and model.
2. Complete catalog information, descriptive literature, specifications, and identification of materials of construction, including headloss characteristics, operating torque, and operational requirements of each valve.
3. Shop Drawings
4. Manufacturer’s operation and maintenance manuals and information.
5. Manufacturer’s installation certificate.
6. Manufacturer’s equipment warranty.
7. Design calculations demonstrating lift loads and deflection in conformance to the application requirements. Design calculations shall be approved by a licensed engineer (PE).
8. Verification that the existing pedestals and existing Rotork model IQFM Actuators are suitable to use with the new 36” sluice gates, include list of necessary bushings and adaptors.
9. Manufacturer’s printed installation instructions for all assemblies and subassemblies.

D. Quality Control. Provide the following:

1. Functional test and results of performance confirmation checks
2. Operation and Maintenance Manuals: Include:
    a. Manufacturers recommended spare parts and special tools.
    b. Maintenance schedule showing the required maintenance, frequency of maintenance, and other items required at each regular preventative maintenance period.
3. Qualifications
    a. All the equipment specified under this Section shall be furnished by a single manufacturer with a minimum of 20-years of experience designing and manufacturing cast iron sluice gates. The manufacturer shall have

manufactured sluice gates of the type described herein for a minimum of 20 similar projects.

b. To ensure quality and consistency, the sluice gates listed in this section shall be manufactured and assembled in a facility owned and operated by the sluice gate manufacturer. Machining, testing and performance verification of the gates shall be in a U.S. facility. The client may verify/view the manufacturing and testing process at the facility. Third-party manufacturers contracted for fabrication and assembly of the sluice gates will not be permitted.

4. Manufacturer's Certificate of Proper Installation and Operation.

a. The Manufacturer shall provide written certification to Contractor for submittal to the Owner and Engineer that the equipment has been correctly installed and is operating properly.

b. The Manufacturer shall submit to Contractor for submittal to the Owner and Engineer, results of testing performed and required by this specification.

c. Manufacturer's Certificate of Training: The Manufacturer will provide a list of signatures of operators who have completed the training requirements of this section.

1.5 MANUFACTURER

A. The Sluice gate manufacturer shall be Waterman Industries LLC, Exeter, California; or approved equal. Local Representative, Rain for Rent, Kenai, AK; 907-398-6919.

1.6 MANUFACTURERS' SERVICES

A. A manufacturer's representative for items specified herein shall be present at the job for two (2) trips of two (2) days duration (not including travel time), for installation assistance, verification of installation, inspection, functional and performance testing, start-up, and job-site training.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Flanges: Securely attach metal, hardboard, or wood protectors over entire gasket surface.

B. Gaskets: Store gaskets in cool, dry, well-ventilated area with no exposure to direct sunlight. Do not allow gasket contact with petroleum products (oil, fuel, and solvents).

C. Threaded or Socket Welding Ends: Fit with metal, wood, or plastic plugs or caps.

D. Cold Weather Storage: Locate products to prevent coating from freezing to ground.

E. Linings and coatings: Protect from damage by heat and excessive drying.

F. Handling: Use heavy canvas or nylon slings to lift pipe and fittings.

PART 2 - EQUIPMENT

2.1 GENERAL

A. The gates shall be either self-contained with yoke and bench-stand operators, or non-self-contained with stem guides and operator, in accordance with the requirements of this specification.

B. CONTRACTOR shall be responsible for coordination of equipment dimensions, installation requirements, weights, and loadings with the listed Manufacturers, and the incorporation of the selected equipment into the dimensional constraints of the building, within the limits of the structural concrete, piping arrangement and of other equipment features as shown on the Drawings.

C. The CONTRACTOR shall work with the sluice gate manufacturer to verify that the existing Rotork actuators are suitable to be reused for the new 36". Determine the need for new slides and bushings as necessary.

D. The gates shall be compliant with the latest version of AWWA C560, as described below.

E. Sluice Gates to open by turning counterclockwise. Non-rising stem.

F. Specific configurations shall be as noted on the gate schedule or as shown on the plans.

G. The two 36" gates shall reuse the existing pedestals and Rotork model IQFM electric actuators. Contractor shall provide necessary bushings and sleaves to adapt these actuators to the new gates.

H. The one 24" gate will require a new slab mounted pedestal and electric actuator. Actuator is specified in section 40.05.65. Contractor is to assure unit integrity.

I. The Contract Documents indicate specific required features of the equipment, but do not purport to cover all details of design and construction.

J. Materials:

COMPONENT	MATERIALS
FRAME, YOKE, COVER SLIDE, WALL THIMBLES	Stainless Steel ASTM A240/A276 AISI Type 316L
YOKES	Stainless Steel ASTM A240/A276 AISI Type 316L
SEATS	Stainless Steel ASTM A240 AISI Type 316, UHMW
FLUSH BOTTOM SEALS	Neoprene ASTM D2000 BC 615/625 Grade BE625
WEDGES AND STEM BLOCKS	Manganese Bronze ASTM B584 Alloy 86500
STEMS	Stainless Steel ASTM A276 AISI Type 316
STEM COVER	Clear Butyrate with Mylar Strip
STEM GUIDES	Stainless Steel ASTM A240/A276 AISI Type 316L UHMW Bushed
WALL BRACKETS	Stainless Steel ASTM A240 AISI Type 316L
PEDESTALS	Stainless Steel ASTM A240/A276 AISI Type 316L
FASTENERS AND ANCHOR BOLTS	Stainless Steel ASTM F593 / F594 Type 316 CW
FINISH	Coal Tar Epoxy (Ferris parts)

EQUIPMENT NUMBER	GATE SIZE, INCH[1]	MOUNTING	OPENING DIRECTION	BOTTOM SEATING	DESIGN HEAD, FEET		OPERATOR TYPE
					SEATING	UNSEATING	
SG-1	36 X 36	Wall Mount-ed	Counter Clockwise	Flush Bottom	29.5	29.5	Electric (Use Existing)
SG-2	36 X 36	Wall Mount-ed	Counter Clockwise	Flush Bottom	29.5	29.5	Electric (Use Existing)
SG-3	24 X 24	Wall Mount-ed	Counter Clockwise	Standard Bottom	32.25	32.25	Electric (New)

Notes: 1. Clear opening width by height.

PART 3 - COMPONENTS

3.1 FRAME AND GUIDES

A. The frame and guides shall be cast one-piece construction or may have guides dowelled and bolted to the frame.

B. A machined dovetail groove for the mounting of the seat facings shall be provided on the front face of the frame for all dovetail embedded seats.

C. The frame shall be provided with cast-on pads which shall be machined, drilled, and tapped for the mounting of the wedge device.

D. The back of the frame flange shall be machined to a plane and drilled to match the wall thimble, pipe flange, or anchor bolt pattern.

E. Guide rails shall be of such length as to retain at least one-half of the vertical height of the slide when it is in the fully opened position.

F. A groove running the full length of the guide shall be accurately machined to receive the slide tongue, with a nominal clearance of 1/16-inch.

3.2 STEMS AND GUIDES

A. New stems and stem guides will be provided for the 36” gates as well as the 24“ gate.

B. The stem shall be solid stainless steel of the specified grade.

C. Stem threads shall be machine cut 29-degree full Acme or stub Acme type.

D. Nominal diameter of the stem shall not be less than the crest of the threaded portion.

E. Stem guides and brackets shall be fabricated stainless steel, with UHMW bushings.

F. Two-piece guides shall be adjustable in two directions and shall be so constructed that, when properly spaced, they will hold the stem in alignment and still allow enough play to permit operation per AWWA C560.

G. Stem guide spacing shall be as recommended by the gate manufacturer for the specific stem size, but in no case shall the unsupported stem length/radius of gyration (l/r) exceed 200.

H. Stem guide brackets shall be secured to the wall by anchor bolts of sufficient strength and arrangement to prevent unacceptable stem guide deflection due to either axial and/or radial stem loading caused by gate operation forces during manual operation, or caused by motor-operator locked rotor stall conditions.

3.3 COVER (SLIDE)

A. The cover shall be designed for the design head indicated with a minimum safety factor of 5 with regard to ultimate tensile, compressive and shear strength.

B. The cover shall be of one-piece cast construction with vertical and horizontal ribs, a reinforced pocket to receive the thrust nut, pads to receive the wedges, and a reinforced periphery around the back side of the cover for machining of the dovetail grooves in which the seating faces shall be mounted.

C. All wedge pads shall be machined, drilled, and tapped to receive the wedge devices.

D. The cover shall have fully machined tongues running the full length of each side to properly engage the guide grooves.

E. A thrust nut shall be provided to attach the slide to the stem. The nut shall be threaded and, in the case of rising stems, provided with keys and/or two set screws locked into indents in the stem to prevent rotation of the stem.

F. For non-rising stems, the stem shall turn freely in the thrust nut, to open and close the slides as the stem is rotated, the nut pocket shall be cast on top of the slide so that the stem does not project into the waterway when the gate is fully opened.

3.4 SEATING FACES

A. All seating faces for both covers and frames shall be malleable corrosion resistant material (see materials section) of a shape that will fill and permanently lock in the dovetail grooves of the slide and the frame. No other means of attachment will be allowed.

B. The seats shall be machined to a 63 micro-inch finish, or better.

3.5 WEDGES

A. All wedges and wedge blocks shall be of solid corrosion resistant material and shall be of sufficient number to provide a practical degree of water tightness per AWWA C560.

B. All wedge bearing surfaces and contact faces shall be machined to give maximum contact and wedging action.

C. Wedges shall be fully adjustable, but once set shall not rotate or move from the set position.

D. All wedge fasteners and adjustment screws shall be corrosion resistant.

3.6 SELF-CONTAINED GATES WITH RISING AND NON-RISING STEMS

A. When a self-contained gate is specified, a yoke shall be mounted on the machined pads provided on the upper ends of the guides.

B. The yoke shall have a machined bearing surface for the lift, pedestal, or pedestal mounting plate.

C. The thrust generated by gate operation shall be contained within the gate assembly.

D. The yoke shall be designed for the thrust produced at actuator rated torque with a safety factor of 5, based on the ultimate strength of the yoke material used.

3.7 WALL MOUNT AND ANCHOR BOLTS

A. Gate anchor bolts shall be corrosion resistant.

B. Gates mounted directly upon the headwall shall be sealed between the gate back and wall with a non-shrink grout. See manufacturers detailed installation instruction.

3.8 PAINTING

A. All cast iron parts of the sluice gate (not bearing or sliding contact) and stem guides shall be painted in accordance with the section on painting found elsewhere in these specifications. That portion of the wall thimbles which will be in contact with concrete shall not be painted.

3.9 SHOP TESTING

A. The completely assembled gate and hoist shall be separately shop-operated to insure proper assembly and operation.

B. The gate shall be adjusted so that a .002" thick gauge (1/2 that required by AWWA standards) will not be admitted at any point between frame and cover seating surfaces.

C. All gates and equipment shall be inspected and approved by a qualified shop inspector prior to shipment.

3.10 INSTALLATION

A. Installation of the gates shall be performed in accordance with standard industry practices. It shall be the responsibility of the CONTRACTOR to handle, store, and install the equipment specified in this Section in strict accordance with the Manufacturer’s recommendations.

B. The CONTRACTOR shall review the installation drawings, installation instructions and verify all dimension prior to installing the gates.

C. The gate frames shall be installed in a true vertical plane, square and plumb, with no twist, convergence, or divergence between the vertical legs of the guide frame.

D. The CONTRACTOR shall fill any void between the guide frames and the structure with non-shrink grout as shown on the installation drawing and in accordance with the grout manufacturer’s recommendations.

3.11 FIELD TESTING

A. After installation, all gates will be field tested in the presence of the ENGINEER and OWNER to ensure that all items of equipment are in full compliance with this Section. Each gate assembly shall be water tested by the CONTRACTOR at the discretion of the ENGINEER and OWNER, to confirm that leakage does not exceed the specified allowed leakage per AWWA C560.

END OF SECTION

SECTION 40 05 65 – SLUICE GATES ACTUATORS

PART 1 - GENERAL

1.1 INTRODUCTION

A. The intent of this work is to provide a high quality, motor driven actuator with local controls; that will open and close the 24” sluice gate.

B. Manufacturer; The manufacture and model shall be Rotork Controls Inc. Type IQ or approved equal

C. Compatibility; Following selection and design of the sluice gate, it is the responsibility of the contractor to assure that the actuator specified here is compatible and capable of operating the 24” sluice gate. Any necessary modifications will be the responsibility of the contractor.

D. Existing Actuators; The two existing pedestals and actuators for the 36” sluice gates will be reused. It will be the contractors responsibility to make any necessary modifications to make the pedestals and actuators serviceable with the new 36” sluice gates and stems. Work could include adjustments, electrical modifications and drive bushings.

1.2 RELATED SECTIONS

A. Municipality of Anchorage Standard Specifications (MASS), Special Provisions, and Division 1 -General Requirements apply to Work of this Section.

B. 01 11 00 --Work Summary

C. 01 33 00 – Submittal Procedures

D. 01 75 00 – Starting and Adjusting

E. 09 90 00 – Painting and Coating

F. Division 26 – Electrical

G. 40 05 07 – Hangers and Supports For Process Piping

H. 40 23 40 – Sanitary Wastewater Process Piping

I. 40-05-60—Sluice Gates

1.3 QUALITY ASSURANCE

A. Reference: American Society for Testing and Materials (ASTM).

B. American National Standards Institute (ANSI);

C. American Society of Mechanical Engineers (ASME)

D. American Water Works Association (AWWA) C542 Electric motor actuators for valves and slide gates

1.4 SUBMITTALS

A. Prepare, deliver, and process under provisions of Section 01 33 00, SUBMITTAL PROCEDURES. Requests for proposed substitute or “or-equal” equipment/systems/products will be considered in accordance with the provisions of paragraph “Substitute and “Or-Equal” Products”.

B. Complete list of all deviations from the Drawings and Specifications.

C. Shop Drawings. Provide the following:

1. Product data sheets for make and model.
2. Complete catalog information, descriptive literature, specifications, and identification of materials of construction, including headloss characteristics, operating torque, and operational requirements of each valve.
3. Shop Drawings
4. Manufacturer’s operation and maintenance manuals and information.
5. Manufacturer’s installation certificate.
6. Manufacturer’s equipment warranty.
7. Design calculations demonstrating lift loads and deflection in conformance to the application requirements. Design calculations shall be approved by a licensed engineer (PE).
8. Verification that the existing Rotork Actuators are suitable to use with the new 36” sluice gates and list any necessary modifications.
9. Manufacturer’s printed installation instructions for all assemblies and subassemblies.

D. Quality Control. Provide the following:

1. Functional test and results of performance confirmation checks
2. Operation and Maintenance Manuals: Include:
    a. Manufacturers recommended spare parts and special tools.
    b. Maintenance schedule showing the required maintenance, frequency of maintenance, and other items required at each regular preventative maintenance period.
3. Qualifications

a. All of the equipment specified under this Section shall be furnished by a single manufacturer with a minimum of 20-years of experience designing and manufacturing cast iron sluice gates. The manufacturer shall have manufactured sluice gates of the type described herein for a minimum of 20 similar projects.

b. To ensure quality and consistency, the sluice gates listed in this section shall be manufactured and assembled in a facility owned and operated by the sluice gate manufacturer. Machining, testing and performance verification of the gates shall be in a U.S. facility. The client may verify/view the manufacturing and testing process at the facility. Third-party manufacturers contracted for fabrication and assembly of the sluice gates will not be permitted.

4. Manufacturer's Certificate of Proper Installation and Operation.

a. The Manufacturer shall provide written certification to Contractor for submittal to the Owner and Engineer that the equipment has been correctly installed and is operating properly.

b. The Manufacturer shall submit to Contractor for submittal to the Owner and Engineer, results of testing performed and required by this specification.

c. Manufacturer's Certificate of Training: The Manufacturer will provide a list of signatures of operators who have completed the training requirements of this section.

1.5 MANUFACTURER

A. The Sluice gate actuator manufacturer shall be Rotork Controls Inc.; or approved equal.

1.6 MANUFACTURERS' SERVICES

A. A manufacturer's representative for items specified herein shall be present at the job for one (1) trip of one (1) day duration (not including travel time), for installation assistance, verification of installation, inspection, functional and performance testing, start-up and job-site training.

PART 2 - EQUIPMENT

2.1 GENERAL

A. Sluice Gates to open by turning counterclockwise.

B. Sluice gates; non-self-contained, Non-Rising Stem.

C. The Contract Documents indicate specific required features of the equipment, but do not purport to cover all details of design and construction.

2.2 DESIGN

A. Duty Rating

1. The below specifications provide duty ratings for multi-turn, part turn and linear output actuators.
2. ISO 22153 duty requirements were developed specifically for electric valve actuators and define load, cycle and start requirements. Duty performances vary with torque and thrust. When actuator operating performance increases, the required duty decreases, reflecting the operational requirements of valves.
3. The referenced “S” duties, in accordance with IEC 60034-1 (Rotating electrical machines – duty and performance), do not accurately reflect variable valve operating load profiles imposed on actuators. As such IEC 60034-1 is not directly comparable and is included for information only.
4. Actuator Type: IQ
5. Duty Class (ISO 22153): A,B (On-Off – Inching)
6. Duty Rating: 15 minutes (S2-15 min/S3 25%) based on 60 starts per hour at a rate of up to 600 starts per hour

B. Design Life (Endurance)

1. Actuators shall meet or exceed the endurance requirements of ISO 2253. The table below details the range design qualification endurance tests.

IQ Output Type	Duty Class (ISO 22153)	Torque/Thrust	Endurance Test
Multi-turn	A,B (Isolating – Inching)	<700Nm (516 lbf.ft)	10,000 cycles (500,000 output turn)/33% rated torque
		701-3,000Nm (517-2,212 lbf.ft)	5,000 cycles (250,000 output turns)/33% rated torque

C. Gate/Actuator Interface

D. Actuator Orientation-- Actuators can be mounted in any orientation. The user/installer is responsible for considered the effects of orientation, clearances and subsequent loading on the supporting structure including any interface adaption kits.

E. Operating Temperature-- Minus 40 degrees F to plus 110 degrees F

F. Hazardous Certification—Actuators shall be suitable for installation in NEC Class 1, Group D, Division 1 hazardous areas

G. Power, Control & Indication

1. Power Supplies—480V, 3 phase, 60 Hz

2. HMI, Local Control, Indication & Set-up--- The high resolution LCD display shall have a wide viewing angle making it easily legible from a distance. The LCD display shall operate from -50 -+70 degrees Celsius.
3. Non-intrusive selectors shall be provided on the actuator electrical control cover which also includes a window showing actuator position, status and alarm display.
4. The control cover may be rotated through 360 degrees (90 degree increments) to suit actuator orientation/operator access.
5. Local Control; Position, “Open” or “Close”
6. Local Indication;
    a. Position Indication—open or close, LCD display and color indication
    b. Status and Alarm—text display, General alarm
7. Required protection and operating features;
    a. Obstructed Gate
    b. Jammed Gate
    c. Torque Switch Bypass
    d. Torque Switch Hammer
    e. Incorrect Phase Rotation
    f. Lost Phase/ Motor overheating
    g. Instantaneous reversal
    h. Actuator Fault
    i. Emergency Shutdown
8. Components
    a. Handwheel—Provide a handwheel to allow manual operation of the valve during electrical power interruption. Handwheel size and mechanical advantage shall generally be designed in accordance with standards EN 12570 and AWWA C540 (American Water Works Association) to give the most efficient compromise of force and turns from emergency operation. Standard Type/Ratio: Direct/1:1
    b. Drive Train-- Actuators shall be factory filled for life with premium quality gear oil selected for the application.
    c. Corrosion Protection-- Paint finishes fully conform to the requirements of ISO 12944.
        1) Corrosive category: C4
        2) coastal environment with moderate salinity
    d. Motor-- Motors shall be integral to the actuator. They shall meet the requirements of IEC 60034 or MG1, for motor design or actuator operation.
        1) Power supply: 480V, 3 phase, 60Hz

2) Duty Classification: On-Off & Inching (Class A & B)

3) Comments: Class F insulated, 3-phase squirrel cage motor incorporating thermostat protection. Low inertia design.

e. Power Module-- The power module for actuators shall produce internal power for control systems and remote control derived from the actuator electrical supply. It also contains the motor control and switching components.

1) Internal Power Supplies: Split bobbin transformer for production control circuits,

2) Motor Switching: Reversing contactor assembly, mechanically and electrically interlocked. 24 VDC coil.

f. Torque Sensor-- Piezo thrust sensor measures motor shaft thrust produced as a reaction to output torque developed in the motor worm and wheel gear assembly. Thrust measured is directly proportional to output torque. Their piezo sensor develops a voltage proportional to shaft thrust (output torque) which is amplified and them measured by the control module. Output torque is controlled by switching the motor off when the set torque limits have been reached. This system allows the torque to be displayed via the LCD display.

g. Position Sensor-- Encoder shall be contactless and have four active parts. It shall be capable of measuring up to 8,000 output turns with a resolution of 7.5 degrees and have redundancy and self checking.

h. Control and User Interface (UI) Modules-- The control and UI modules for IQ actuators are common and take the form of a PCB with on=board liquid crystal displays (LCD) and a control PCB.

i. Control Features:

Feature	Type	Specification
Remote control	Input	User switched Open/Close/Stop/ESD and inter-lock signals. Opto-isolated inputs for protection.
Local control	Input	Open/Close/Stop and Local/Remote selection. Non-intrusive control switches re magnetically op-erated so there is no penetration of covers.
Position	Input	Digital signal derived by absolute position sensor. Resolution to 7.5 degrees of output rotation. Limit range configurable between 2.5 and 89,000 out-put turns.
Torque	Input	The piezo thrust sensor directly measures output torque and converts valve to a voltage signal. Torque can be set in the range 40% to 100% or rated torque with the additional facility to bypass torque switching.
Set-up	Input	Set-up over the Bluetooth interface allows all set-tings to be configured for valve and process re-quirements. Set-up is non-intrusive requiring no covers be removed using the supplied Rotork Bluetooth Setting Tool Pro. All settings can be password protected.

Indication contacts	Output	Four Volt free contacts S1 to S4 can be configured for a variety of position, status and alarm indication for remote indication and monitoring.
LCD indication	Output	The onboard backlit LCD display presents position, torque and setup displays for configuration. The LCD display is divided into two parts providing a large position indication (Open/Close icons plus % redout in 0.1% increments for mid travel) and a multilingual text display providing status, alarm and set up information.
Data logger	Output	The control module includes a data logger which stores torque, position and operational data in non-volatile memory for download via Bluetooth to the supplied Rotork Bluetooth Setting Tool Pro or notebook PC. Data is date/time stamped. Data logger can be analyzed using freeware Insight 2 for PC.
Memory	System	All configured settings are stored in non-volatile EEPROM memory (does not require power).
Micro-controller	System	Provides all control function logic, setup programming and allied system requirements. Software is field upgradeable for future enhancements. The micro-controller is widely used in the automotive industry with a long track record and a very reliable history.

END OF SECTION

SECTION 40 23 40 – SANITARY WASTEWATER PROCESS PIPING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish, install, and test the process piping systems and appurtenances, complete and functional, as specified herein and as shown on the Drawings.

B. Systems include process piping and fittings/appurtenances within the Pump Station 12 building and structures.

1.2 RELATED SECTIONS

A. Municipality of Anchorage Standard Specifications (MASS), Special Provisions, and Division 1 -General Requirements apply to Work of this Section.

B. 01 11 00 – Summary of Work

C. 01 33 00 – Submittal Procedures

D. 01 75 00 – Starting and Adjusting

E. 09 90 00 – Painting and Coating

F. 40 05 07 – Hangers and Supports for Process Piping

G. 40 05 53 – Process Valves

H. 43 23 00 – Dry Location Liquid Pumps

1.3 QUALITY ASSURANCE

A. Standards, American Society for Testing and Materials (ASTM), American Water Works Association (AWWA), American National Standards Institute (ANSI), American Iron and Steel Institute (AISI), and American Welding Society (AWS).

1.4 SUBMITTALS

A. Prepare, deliver, and process under provisions of Section 01 33 00, SUBMITTAL PROCEDURES. Requests for proposed substitute or “or-equal” equipment/systems/products will be considered in accordance with the provisions of paragraph “Substitute and “Or-Equal” Products”.

B. Complete list of all deviations from the Drawings and Specifications.

C. Shop Drawings. Provide the following:

1. Pipe manufacturer’s product information including:
    a. Dimensional data. Show wall thickness of steel cylinder and fittings.
    b. Material of construction, with ASTM reference and grade. Submit manufacturer’s certificates of compliance with referenced pipe standards, e.g., ASTM A312, A403, A774, A778.
    c. Performance data 1) Pressure ratings 2) Temperature limitations and chemical compatibility
2. Schedule of piping and type, interconnection to existing piping, interconnection to equipment, connection to vents and drains, and method of connection.
3. Piping layout drawings showing the location and dimensions of the pipe and fittings. Include layout lengths of valves, meters, pumps, and other equipment determining piping dimensions. Label or number each fitting or piece of pipe. Show:
    a. Centerline dimensioning of piping from column lines and/or face of walls.
    b. Centerline dimensioning and indication of elevation of ductwork, conduit, or other interfering item or object which may require coordination.
4. Shop Fabricated Piping. Where piping systems are fabricated in a location other than the project site, submit shop drawings for prefabricated piping systems including:
    a. Pipe fabrication and spool drawings.
    b. Fittings layout, and location of each pipe length.
    c. Installation sequence.
5. Manufacturer’s data for flange and coupling gaskets.
6. Pipe support systems manufacturer’s product information and seismic design and bracing per the requirements of, and submitted under specification Section 40 05 07, HANGERS AND SUPPORTS FOR PROCESS PIPING.
7. Revisions to interior piping and pipe support drawings as required.
8. Qualifications of pipe supplier for plant-applied linings and coatings.
9. Special shipping, storage, protection and handling instructions.

D. Quality Control. Provide the following:
1. Certification of welder qualifications in accordance with ANSI B31.1, Paragraph 127.5 for shop and project site welding of pipe work.
2. Pipe, fittings, and appurtenances:
    a. Confirmation of product(s) compliance with specified standards.
    b. Manufacturer's Certification of Compliance.
3. Pipe supports: Manufacturer's Certification of Compliance.
4. Pipe leakage testing.
    a. Testing plan and methods.

b. Certifications of Calibration: Testing equipment.

c. Certified pipe test reports.

5. Operation and Maintenance Manuals: Include:

a. Manufacturers recommended spare parts and special tools.

b. Maintenance schedule showing the required maintenance, frequency of maintenance, and other items required at each regular preventative maintenance period.

6. Manufacturer's Certificate of Proper Installation and Operation.

a. The Manufacturer shall provide written certification to Contractor for submittal to the Owner and Engineer that the equipment has been correctly installed and is operating properly.

b. The Manufacturer shall submit to Contractor for submittal to the Owner and Engineer, results of testing performed and required by this specification.

7. Manufacturer's Certificate of Training: The Manufacturer will provide a list of signatures of operators who have completed the training requirements of this section.

1.5 PIPE SUPPORT SYSTEMS

A. Provide pipe hangers, supports, and seismic bracing per the requirements of specification Section 40 05 07, HANGERS AND SUPPORTS FOR PROCESS PIPING, or as indicated on Drawings.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Flanges: Securely attach metal, hardboard, or wood protectors over entire gasket surface.

B. Gaskets: Store gaskets in cool, dry, well-ventilated area with no exposure to direct sunlight. Do not allow gasket contact with petroleum products (oil, fuel, and solvents).

C. Threaded or Socket Welding Ends: Fit with metal, wood, or plastic plugs or caps.

D. Cold Weather Storage: Locate products to prevent coating from freezing to ground.

E. Linings and coatings: Protect from damage by heat and excessive drying.

F. Handling: Use heavy canvas or nylon slings to lift pipe and fittings.

PART 2 - PRODUCTS

2.1 GENERAL

A. These requirements are in addition to the requirements found in MASS Section 50.02 – Furnish and Install Pipe.

B. CONTRACTOR shall be responsible for modification of appurtenant equipment and piping to accommodate selected equipment. CONTRACTOR shall notify Engineer and Owner of modifications necessary to accommodate selected equipment and shall submit for review and approval the proposed modifications.

C. The Contract Documents indicate specific required features of the equipment, but do not purport to cover all details of design and construction.

2.2 PIPING

A. Piping and appurtenances specified herein per referenced standards shall meet the requirements of the most recent version of said standards.

B. Piping and appurtenances shall be in accordance with the provisions of the most current version of the International Plumbing Code (IPC) as amended and adopted by the State of Alaska.

C. CONTRACTOR shall be responsible for modification of appurtenant equipment and piping to accommodate selected equipment. CONTRACTOR shall notify Engineer and Owner of modifications necessary to accommodate selected equipment and shall submit for review and approval the proposed modifications.

D. The Contract Documents indicate specific required features of the equipment, but do not purport to cover all details of design and construction.

E. CEMENT LINED DUCTILE IRON (DIP)

1. Thickness Design: AWWA C150/ ANSI A21.50.
2. Pipe Barrel: AWWA C151/ ANSI A21.51.
3. Threaded Flanged Pipe. AWWA C115 / ANSI A21.15; minimum Class 53; flange 250-pound flat face.
4. Grooved Pipe: Pipe per AWWA C151/ ANSI A21.51, minimum Class 53; grooved per ANSI/AWWA C606.
5. Interior Lining for pipe and fittings: AWWA/ANSI C104/A21.4, Cement-Mortar Lining for Ductile-Iron Pipe and Fittings.
6. Exterior Coating for pipe and fittings:
    a. Factory Coat. The exterior surfaces of pipe and fittings shall be prepped SSPC SP6 and provided with the Manufacturer applied factory coating of **high-solids, epoxy primer**.

b. Field Coating. The exterior surfaces of pipe and fittings shall be prepared and shop/field coated per the requirements of Section 09 90 00, PAINTING AND COATING, System No. 4, and the recommendations of pipe and coatings manufacturers.

c. Contractor/Supplier may offer alternatives of Fusion Bonded Epoxy coating in lieu of the systems above.

7. Joints/Couplings:

a. Ductile iron, ASTM A-536 65-45-12, for rigid radius cut groove, per ANSI/AWWA C606. Enamel Coating. ASTM A193 316 Stainless Steel, Grade B-8M, Class 2 nuts and bolts. Halogenated butyl gaskets.

b. Manufacturer and Model. Victaulic Company. Or approved equal.

1) Coupling Style 31

2) Flange Adapter Style 341 Vic-Flange

3) Transition Coupling Style 307

8. Fittings:

a. Interior and above grade pipe systems:

b. Fittings shall have the same lining, coating and the same or higher pressure rating as the pipe.

c. All Elbows shall be short radius, unless noted otherwise.

d. Flanged:

1) Flanges: ANSI/AWWA C110/A21.10 250-pound flat face, or ANSI/ASME B16.1 125-pound or 150-pound flat face.

2) Gaskets: 1/8-inch thick styrene butadiene rubber (SBR) or (poly)chloprene rubber (CR).

3) Bolts, Nuts and Washers: ASTM F593, Group 1 stainless steel hex head bolts and ASTM F594 hex head nuts. Washers shall be the same material as the bolts.

4) Including blind flanges, companion flanges, and spool pieces as called out and detailed on the Drawings. Blind flanges shall be gasketed covering the entire inside face with the gasket cemented to the blind flange.

e. Grooved:

1) Ductile iron, ASTM A-536 65-45-12, per ANSI/AWWA C606. 316 Stainless Steel, Grade B-8M, Class 2 nuts and bolts. Halogenated butyl gaskets. Enamel Coating.

2) Dimensions including wall thickness per ANSI AWWA C110/ ANSI A21.10 and C153.

3) Including other couplings and fittings as called out and detailed on the Drawings.

f. Mechanical Joint Fittings: ANSI/AWWA C110/A21.10 and ANSI/AWWA C111/A21.11

g. Push-On Restrained Joint Fittings:

1) Fittings: ANSI/AWWA C153/A21.53.

2) Gaskets: ANSI/AWWA C111/ANSI A21.11.

3) Lubricant: ANSI/AWWA C600.

h. Restrained Flanged Coupling Adapter

1) Flange: Ductile Iron ASTM A536 Grade 65-45-12, ANSI Class 150. Gasket: O-ring style, Nitrile Butadiene Rubber (NBR), ASTM D 2000.

2) Gland. Ductile Iron ASTM A536 Grade 65-45-12, ANSI Class 150. Gasket: Styrene Butadiene Rubber (SBR), ASTM D 2000 MBA 710.

3) Restraining Bolt: 7/8-inch 9 roll thread, 316 stainless steel.

4) Restraining Lugs: Ductile iron, ASTM A 536.

5) Lug Locators: Polyurethane, a thermal plastic.

6) T-bolts and Nuts: Stainless steel. National coarse rolled thread and heavy hex nut.

7) Coatings: factory applied fusion bonded epoxy.

8) Manufacturer and Catalog Number: Romac Industries, Inc. RFCA-6.90. Or approved equal.

i. Dismantling Joint

1) Flange Spool: Schedule 40 ASTM A53, ANSI Class 150.

2) Body: Ductile Iron ASTM A536 Grade 65-45-12, ANSI Class 150.

3) Gasket: O-ring style, Nitrile Butadiene Rubber (NBR), ASTM D 2000.

4) Restraining Bolt: 7/8-inch 9 roll thread, 316 stainless steel.

5) Restraining Lugs: Ductile iron, ASTM A 536.

6) T-bolts and Nuts: Stainless steel. National coarse rolled thread and heavy hex nut.

7) Coatings: factory applied fusion bonded epoxy.

8) Manufacturer and Catalog Number: Romac Industries, Inc., DJ405. Or approved equal.

j. Flexible Coupling

1) Castings: Ductile Iron ASTM A536 Grade 65-45-12.

2) Gaskets: Styrene Butadiene Rubber (SBR), ASTM D 2000 MBA 710.

3) Bolts and Nuts: 5/8-inch, Stainless steel.

4) Coatings: factory applied fusion bonded epoxy.

5) Manufacturer and Model: Romac Industries, Inc., Style 501. Or approved equal.

9. Buried Restrained Joint Fittings:

a. Coating and Lining: Fusion Bonded Epoxy per ANSI/AWWA C116/A21.6

b. Push-On:

1) Fittings: ANSI/AWWA C153/A21.53

2) Gaskets: ANSI/AWWA C111/ANSI A21.11

3) Lubricant: As recommended by the Manufacturer.

4) Manufacturer and Catalog Number:
   a) Gasket: US Pipe and Foundry Co., FIELD LOK 350, or approved equal.
   b) Fittings: Sigma Corporation, Star Pipe Products, McWane Tyler Union, cap; or approved equal.

c. Mechanical Joint (MJ), Mechanical Joint (MJ)

1) Fittings: ANSI/AWWA C153/A21.53

2) Gaskets: styrene butadiene rubber per ANSI/AWWA C111/ANSI A21.11

3) T-head Bolts and nuts: ASTM F593 316 stainless steel, ANSI/AWWA C111/ANSI A21.11

4) Manufacturer and Catalog Number: Star Pipe Products. Or approved equal:
   a) Bell to Bell; MJ x MJ Adapter Series 100;
   b) Plug MJ Bell, Standard MJ Plug, length of bolt as required for fitting type found in the field (up to 4.5inches).

d. Mechanical Joint (MJ), plain end:

1) Fittings: ANSI/AWWA C153/A21.53

2) Gaskets: ANSI/AWWA C110/ANSI A21.10/ C111/ANSI A21.11

3) Lubricant: As recommended by the Manufacturer.

4) Manufacturer and Catalog Number:

   a) American Cast Iron Pipe Company, Field Flex-Ring Restrained Joint, MJ Coupled Joint with rectangular cross section sigot glands and field welding as required. Or approved equal.

e. Fittings: Sigma Corporation, Star Pipe Products, McWane Tyler Union, cap. Or approved equal.

F. HIGH DENSITY POLYETHYLENE PIPE (HDPE)

1. General

a. High Density Polyethylene Pipe (HDPE) and fittings are to be manufactured in accordance with AWWA C906. In addition to the requirements of AWWA C906, HDPE is to be manufactured from PE4710 polyethylene compounds that meet or exceed ASTM D3350 Cell Classification 445574. HDPE pipe and fitting material compound are to contain color and ultraviolet (UV) stabilizer meeting or exceeding the requirements of Code C per ASTM D3350.

b. All core HDPE pipe and fittings shall conform to standard iron pipe size outside dimensions (IPS), have a wall thickness meeting SDR 11, and have a minimum pressure rating of 200 psi according to ASTM D2837 at 73°F with a service rating of 0.5. All HDPE pipe shall be from straight sticks of pipe. Under no circumstances shall any coiled HDPE pipe be used to manufacture products furnished under this specification. All core HDPE pipes shall be black, stamped with the appropriate SDR and ASTM designations.

c. All HDPE pipe and fittings shall be homogeneous throughout, free of visible cracks, holes, foreign inclusions, blisters, dents, or other injurious defects, and shall be made of materials having the same chemical and physical characteristics. All HDPE pipe ends shall be free from chips, gouges, and other damage. All HDPE pipe and fittings shall be designed for direct pipe-to-pipe or pipe-to-fitting thermal butt fusion or electrofusion jointing, as shown on the drawings.

2. Fittings

a. Interior and above grade pipe systems:

b. All core HDPE fittings shall be manufactured to be as strong as or stronger than the pipe the fittings will be joined to, and shall maintain identical IPS outside dimension on stub-outs, and shall conform to the minimum pressure rating.

c. Fittings shall meet AWWA and ASTM-D3350 and ASTM-F1055 requirements.

d. All Elbows shall be short radius, unless noted otherwise.

e. Electrofusion Branch Saddle Fittings: Saddles shall be PE4710 Electrofusion Branch Saddle by Central Plastics Company, or approved equal.

f. Electrofusion Flex Restraint: Restraints shall be PE4710 SDR11 IntegriFuse Electrofusion Flex Restraint by Integrity Fusion Products, Inc., or approved equal.

g. For flange connections, use Type 316 stainless steel backing plates and fasteners.

h. Bolts, Nuts and Washers: ASTM F593, Group 1 stainless steel hex head bolts and ASTM F594 hex head nuts. Washers shall be the same material as the bolts.

G. WELDED STEEL (CARBON STEEL (CS))

1. Pipe shall conform to ASTM A106, Grade B, seamless and ASTM A53, Grade B seamless or electric resistance welded. Threaded, butt-welded, grooved end, and flanged joints

a. Wall thickness at least 3/16-inch but not greater than Schedule 20 for RAS piping as identified on the drawings.

b. Thin walled steel pipe requires specialty roll grooved ends.

2. Fittings:

a. Butt Welded: Wrought carbon steel butt-welding, ASTM A234/A234M, Grade WPB meeting the requirements of ANSI B16.9; fitting wall thickness to match adjoining pipe.

b. Grooved End: Malleable iron ASTM A47 or ductile iron ASTM A536, grooved ends to accept couplings without field preparation. Victaulic

c. All Elbows shall be short radius, unless noted otherwise.

3. Flanges:

a. Butt-Welded Systems: Forged carbon steel, ASTM A105/A105M, NSI B16.5 Class 150 or Class 300 slip-on or welding neck, 1/16-inch raised face; weld neck bore to match pipe internal diameter. Use weld neck flanges when abutting butt-weld fittings.

b. Grooved End Adapter Flange: Ductile iron, ASTM A-536 65-45-12; and carbon steel ASTM A-53, Grade B. Enamel Coating. Manufacturer. Victaulic Company. Or approved equal.

c. Cast Iron Mating Flange: AWWA C207, Class D or E, hub orring type, ANSI B16.1, 125-pound drilling, AWWA C207 Class F hub type or ASTM A105/A105M, ANSI B16.5 Class 300-pound, drilling.

d. Including blind flanges and spool pieces as called out and detailed on the Drawings.

e. Gaskets: 1/8-inch thick styrene butadiene rubber (SBR) or (poly)chloprene rubber (CR). Blind flanges shall be gasketed covering the entire inside face with the gasket cemented to the blind flange.

4. Joints/Couplings:

a. Grooved Couplings. For roll grooved ends, flexible joint. Ductile iron, ASTM A-536 65-45-12, per ANSI/AWWA C606. Enamel Coating. ASTM F594, Group 2, 316 Stainless Steel, nuts and bolts, with galling resistant coating. Halogenated butyl Nitrile gaskets.

1) Manufacturer and Model. Victaulic Company. Or approved equal.
   a) Standard Flexible Coupling: 12-inch and smaller; Victaulic Style 77.
   b) Screwed End: Malleable iron, ASTM A197 or A47.

5. Bolts and Nuts:

a. For Flanges:

1) Bolts and nuts for flanges shall be stainless steel conforming to ASTM A193, Grade B8M, for bolts and ASTM A194, Grade 8M, for nuts.

2) Bolts for flange insulation kits shall conform to ASTM A 193, Grade B7. Nuts shall conform to ASTM A194, Grade 2H.

3) Provide washer for each nut. Washers shall be of the same material as the nuts.

b. For Grooved End Couplings:

1) 316 Stainless Steel, Grade B-8M.

c. Lubricant for Stainless Steel Bolts and Nuts: Lubrication shall be TRX-Synlube by Ramco, Anti-Seize by Ramco, Jusk IT Husky Lube O'Seal, or approved equal.

6. Lining and Coating:

a. The interior surfaces of pipe and fittings shall be prepared and coated with **System B** per the requirements of Section 09 90 00, PAINTING AND COATING.

b. The exterior surfaces of pipe and fittings shall be prepared and shop/field coated with **System A** per the requirements of Section 09 90 00, PAINTING AND COATING.

c. For Option of Factory Coatings

1) Same lining and coating as above, or approved alternative, which may include fusion bonded epoxy (FBE).

2) Factory applied lining and coating: Interior lining and exterior coating to be held back from weld ends to avoid damage during field welding. Lining system weld hold back distance to be coordinated with coating system manufacturer.

3) Following weld inspections and testing, field prepare and finish lining and coating at weld areas.

H. STAINLESS STEEL (SST)

1. Pipe shall conform to ASTM A312 or A778, Grade 304L or Grade 316 as indicated in the Drawings and/or Specifications. If not indicated, use Grade 304L. Pipe sizes and wall thickness shall conform to ANSI B36.19.

a. 3-inch and larger: Schedule 20S.

b. Thin walled stainless steel pipe requires specialty roll grooved ends.

2. Fittings:

a. Aboveground or exposed pipe larger than 2.5 inches: fittings shall be butt-welded, grooved, or flanged, conforming to ASTM A403, Class WP same material and wall thickness as the connecting piping, conforming to ANSI B16.9.

b. All Elbows shall be short radius, unless noted otherwise.

3. Joints/Couplings:

a. Aboveground or exposed pipe larger than 2.5-inches: joints shall be rigid grooved end or flanged. Grooved-end joints shall be of the roll-grooved type.

b. Stainless steel pipe fabricated into spool pieces shall have shop-welded circumferential butt-weld joints or flanges.

c. Grooved Couplings. For roll grooved ends, flexible joint. Ductile iron, ASTM A-536 65-45-12, per ANSI/AWWA C606. Enamel Coating. ASTM F594, Group 2, 316 Stainless Steel, nuts and bolts, with galling resistant coating. Halogenated butyl Nitrile gaskets.

1) Manufacturer and Model. Victaulic Company. Or approved equal.
a) Standard Flexible Coupling: 12-inch and smaller; Style 77.

4. Bolts in exposed service shall conform to ASTM A193, Grade B8M, Class 2.
5. Thread Lubricant: Use Teflon thread lubricating compound or Teflon tape.
6. Lubricant for Stainless Steel Bolts and Nuts: Lubrication shall be TRX-Synlube by Ramco, Anti-Seize by Ramco, Jusk IT Husky Lube O'Seal, or approved equal.
7. Finish: After all shop operations have been completed, pipe and fittings shall be pickled and passivated in manufacturer's plant, and scrubbed and washed until discoloration and possible iron picked up from manufacturing process are removed. The standard finish for 16-gage through 8-gage material shall be No. 1 or 2B per ASTM A480; 3/16-inch and heavier plate material shall be No. 1 mill finish or better per ASTM A480.

I. CHLORINATED POLYVINYL CHLORIDE (CPVC)

1. Pipe shall conform to ASTM F441 and the following:
   a. Schedule 80
   b. ASTM D1784, Type IV, Grade 1. Cell classification 23447-B.
2. Fittings:
   a. Schedule 80, Series 150. ASTM F437, threaded. ASTM F439, socket.
3. Joints: Solvent socket weld. Threaded or flanged joints shall be provided at unions, valves and equipment as required.
4. Flanges: One piece molded hub type CPVC flat face flange conforming to the physical properties of the fittings, faced and drilled to 150-pound ANSI B16.5
5. Gaskets: 1/8-inch thick
   a. Viton for systems carrying soda ash and chlorine solution
   b. Styrene butadiene rubber (SBR) or (poly)chloprene rubber (CR) wor systems carrying water (W3)
6. Seals/O-rings: EPDM
7. Bolts, Nuts, Washers: ASTM B164 Class A, alloy-stainless steel, Monel 400; ANSI B18.2.1 hex head bolts and ANSI B18.2.2 hex head nuts. Washers shall be the same material as the bolts.
8. Primer and Cement: As per manufacturer's recommendations, meeting ASTM D-2564.
9. Thread Lubricant: Teflon tape.

J. GALVANIZED STEEL PIPE (GAL)

1. Pipe: Schedule 40, ASTM A106, Grade B, or ASTM A53 Rev A-93, Grade B seamless.
2. Fittings:
   a. Threaded: 150-pound malleable iron, ASTM A197, ANSI B16.3.

b. Grooved end: 250 psi working pressure, malleable iron ASTM A47 or ductile iron ASTM A536. Victaulic.

3. Joints: Threaded or flanged, rigid groove end, AWWA C606.

4. Flanges:

a. Galvanized forged carbon steel, ASTM A105/A105M, ANSI B16.5 Class 150, 1/16-inch raised face.

b. Galvanized Grooved end adapter flange, malleable iron ASTM A47 or ductile iron ASTM A536. Victaulic.

5. Bolts, Nuts and Washers: ASTM F2329 Hot dip zinc coated.

a. ANSI/ASME B18.2.1, ASTM A307, Grade B hex-head bolts.

b. ANSI/ASME B18.2.2, ASTM Grade A563 hex-head nuts. Washers shall be the same material as the bolts.

6. Gaskets:

a. All flanges: 1/8-inch thick compressed inorganic fiber with nitrile binder.

b. Grooved couplings: EPDM or nitrile per ASTM D2000 and AWWA C606.

7. Threads: bare threads on all threaded components and connections shall be coated with brush-on galvanized coating.

8. Coating:

a. The exterior surfaces of galvanized steel pipe and fittings shall be prepared SSPC SP6 and shop/field coated with **System A** per the requirements of Section 09 90 00, PAINTING AND COATING.

K. HOSE

1. Service: Temporary Pumping, as required.

2. Provide continuous lengths of 6-inch lay-flat hose for each temporary pumping application.

3. Hose Ends (Flange, thread, coupling, as required) to match/mate with connecting equipment.

4. Lay-flat, rubber tube and liner with woven textile polyurethane cover. Working pressure rating: 300 psi.

a. Manufacturer and Product: Angus Flexible Pipelines, Wat-Hog. Or approved equal.

2.3 SUPPORT SYSTEMS

A. Furnish pipe hangers, supports, and seismic bracing per the requirements of specification Section 40 05 07, HANGERS AND SUPPORTS FOR PROCESS PIPING, or as indicated on Drawings.

2.4 WALL PENETRATIONS

A. Walls penetration seals for pipe wall penetrations shall be modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and wall opening. Links shall form a continuous rubber belt around the pipe with a pressure plate under each bolt head and net. After the seal assembly is positioned in the sleeve, tightening of the bolts shall cause the rubber sealing elements to expand and provide an absolutely watertight seal between the pipe and wall opening. Seals shall be sized for the wall penetration sleeve in accordance with the manufacturer's recommendations. Seals shall be Link-Seal modular seal, or approved equal.

B. Wall penetration seals shall be pressure resistant to 20 psig. Associated hardware shall be 316 stainless steel. Gaskets shall be EPDM (standard).

C. Wall pipes shall have integral shop welded wall stops, circumferentially welded to the pipe run.

2.5 ACCESSORIES

A. Vibration Isolation Pads, Neoprene Pads:

1. Type: Neoprene Waffle.
2. Manufacturers and Product:
    a. Mason Industries, Inc., Anaheim, CA; Type W.
    b. Korfund Dynamics (VMC), Bloomingdale, NJ; Korpad.

2.6 PIPE INSULATION

A. Closed cell-type, elastomeric foam tube insulation, ASTM C534 Type 1.

1. Thermal Conductivity: 0.27 BTU-in/hr-ft2-°F, ASTM C177 or C518.
2. Water Vapor Permeability: 0.08 perm-inch, ASTM E96.
3. Mold Growth: UL 181.
4. Water Absorption: 0.2 % by volume, ASTM C209.
5. Adhesive and Seam Sealant: Per manufacturer's recommendation.
6. Manufacturer and Products: AP Armaflex Tube, white. Adhesive: Armaflex 520. Or Approved Equal.

2.7 IDENTIFICATION LABELS

A. Pipe Labels and Flow Direction Arrows

B. Material: Manufacture from or encase in outdoor grade plastic or vinyl that will resist damage or fading from wash down, sunlight, mildly corrosive atmosphere, dirt, grease, and abrasion.

C. Message: See Piping Schedule.

D. Label, Lettering Size, and Color: ANSI A13.1.

1. Snap-Around Type: Size for finished outside diameter of pipe and insulation.

2. For 6-inch and larger diameter pipe: May furnish strap-on type fastened without use of tools, with plastic or Type 316 stainless steel straps.

3. Firmly grip pipe so labels remain fixed in vertical pipe runs.

E. Manufacturers and Products:

1. Seton Identification Products, Branford, CT; Setmark Pipe Markers.

PART 3 - EXECUTION

3.1 STORAGE AND HANDLING

A. Store all piping materials as per the manufacturer’s recommendations.

B. Ropes, fabric, or rubber-protected slings shall be used to handle pipe.

C. Pipe shall be handled in such a manner that it not be dragged over sharp or cutting objects.

3.2 EXAMINATION

A. Verify size, structure penetrations, material, joint types, elevation, horizontal location, and pipe service to be connected to pipelines and equipment.

3.3 PREPARATION

A. Inspect pipe and fittings before installation, clean ends thoroughly, and remove foreign matter and dirt from inside.

B. Damaged Coatings and Linings: Repair using original coating and lining materials in accordance with manufacturer's instructions.

3.4 INSTALLATION-GENERAL

A. Join pipe and fittings in accordance with manufacturer's instructions, unless noted otherwise.

B. Flanged Joints:

1. Set pipe with the flange bolt holes straddling the pipe horizontal and vertical centerline, aligned with connecting equipment flanges, or as shown. Install pipe

without springing, forcing, or stressing the pipe or any adjacent connecting valves or equipment.

2. Lubricate bolts prior to installation.
3. Use torque-limiting wrenches to ensure proper bearing and bolt tightness.
4. Plastic Flanges:
    a. Install annular ring filler gasket at joints of raised-face flange.
    b. Use Van Stone flanges for thermoplastic flanged connections.
5. Raised-Face Flanges: Use flat-face flange when joining with flatfaced ductile or cast iron flange.
6. HDPE joints shall be re-tightened at least once, 24-hours after initial bolt tightening to allow for contraction of the material.

C. Threaded and Coupled Joints:
1. Conform to ANSI B1.20.1.
2. Ream, clean, and remove burrs from threaded piping before making up joints. Apply thread lubricant to threaded ends before installing fittings, couplings, unions, or joints.
3. Produce sufficient thread length to ensure full engagement when screwed home in fittings.
4. Counter-sink pipe ends, ream and clean chips and burrs after threading.
5. Make connections with not more than three threads exposed.

D. Couplings:
1. Install in accordance with manufacturer's written instructions.
2. Before coupling, clean pipe holdback area of oil, scale, rust, and dirt. Do not remove pipe coating. If damaged, repair before joint is made.

E. Installing Grooved-End Piping
1. Install grooved-end pipe and fittings in accordance with the coupling manufacturer’s recommendations and the following:
2. Clean loose scale, rust, oil, grease, and dirt from the pipe or fitting groove before installing coupling. Apply the coupling manufacturer’s gasket lubricant to the gasket exterior including lips, pipe ends, and housing interiors.
3. Fasten coupling alternately and evenly until coupling halves are seated.

3.5 INSTALLATION-EXPOSED PIPING

A. Route piping:
1. To conserve building space
2. To avoid interference with other work and use of space

3. Beneath elevated grating system as much as possible as this provides minimal tripping hazards for the process area.

4. To enable easy access to valves and instrumentation by operations and maintenance personnel.

3.6 INSTALLATION-BURIED FITTINGS

A. Restrained Push-on Fittings

1. Make square field cuts of designated pipes to be cut and receive fittings. Prepare (grind, square, and bevel) the pipe ends per the fitting Manufacturer's recommendations.

2. Clean, inspect and prepare pipe end, and fitting socket and restraining gasket, and make push-on, restrained joints per the Manufacturer's installation recommendations.

B. Restrained Mechanical Joint plain ends and Fittings. Clean, inspect and prepare pipe end, and fitting socket and restraining gasket, and make MJ restrained joints per the Manufacturer's installation recommendations.

3.7 PIPE SUPPORT SYSTEMS – INSTALLATION

A. Install pipe hangers, supports, and seismic bracing per the requirements of specification Section 40 05 07, HANGERS AND SUPPORTS FOR PROCESS PIPING, or as indicated on Drawings.

3.8 FIELD FINISHING

A. Coat atmospheric exposed surfaces of black, hot-dip galvanized steel components and other designated pipes and piping systems as required in specification Section 09 90 00, PAINTING AND COATING.

3.9 CLEANING

A. Following assembly and prior to testing, and as required for final acceptance, flush pipelines with water at a minimum of 2.5 foot per second to flush out debris.

3.10 PRESSURE LEAKAGE TESTING

A. PREPARATION

1. Piping shall be flushed or cleaned as appropriate prior to testing of this section.

2. Do not perform pneumatic testing on CPVC, PVC or HDPE piping.

3. Pressure Piping:

a. Install temporary thrust blocking or other restraint as necessary to protect adjacent piping or equipment and make taps in piping prior to testing.

b. Prior to test, remove or isolate equipment that could be damaged by test and isolate equipment that may interfere with test.

B. QUALITY ASSURANCE

1. Flow meters shall record the actual volume plus or minus 2 percent.

2. Air test gauges shall be ANSI/ASME B40.1, Grade 3A (plus or minus 0.25 percent of full scale accuracy), 15 psi dial range.

3. Water test gauges shall be ANSI/ASME B40.1, Grade 2A (plus or minus 0.5 percent of full scale accuracy), dial range approximately twice the required test pressure.

C. HYDROSTATIC TEST FOR PRESSURE PIPING

1. See testing procedures found in Section 50.09 – Slipline Sanitary Sewer Force Mains.

D. HYDROSTATIC TEST FOR BURIED GRAVITY FLOW PIPE

1. See testing procedures found in Section 50.09 – Slipline Sanitary Sewer Force Mains.

E. FIELD QUALITY CONTROL

1. Test Report:

a. Provide records of each piping installation during the testing. These records shall include:

b. Date of Test.

c. Identification of pipeline, or pipeline section, tested or retested.

d. Identification of pipeline material.

e. Identification of pipe specification.

f. Test fluid.

g. Test pressure.

h. Remarks: Leaks identified (type and location), types of repairs, or corrections made.

2. CONTRACTOR shall sign to represent that specified testing has been completed.

3.11 IDENTIFICATION LABELS

A. Pipe Labels and Flow Indication Arrows:

1. Apply to indoor piping.

2. Locate at equipment connections, valves, wall and floor boundaries.

3. At 8-feet on center with at least one label applied to each exposed horizontal and vertical run of pipe.
4. At exposed piping not normally in view, such as in cabinets.
5. Installation: In accordance with manufacturer's instructions.

END OF SECTION

SECTION 40 90 00 – PROCESS CONTROL AND INSTRUMENTATION SYSTEMS

PART 1 - GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall provide all Process Control and Instrumentation Systems (PCIS), less programming, complete and operable, in accordance with the Contract Documents. All programming and configuration shall be done by the ENGINEER and OWNER.

B. The requirements of this Section apply to all components of the PCIS, unless indicated otherwise.

C. Responsibilities
   1. The CONTRACTOR, through the use of an Instrumentation Supplier, panel fabricator, and qualified electrical and mechanical installers, shall be responsible to the OWNER for the implementation of the PCIS and the integration of the PCIS with other required instrumentation and control devices.
   2. Due to the complexities associated with the interfacing of numerous control system devices, it is the intent of these Specifications that the Instrumentation Supplier be responsible to the CONTRACTOR for the integration of the PCIS with devices provided under other sections, with the objective of providing a completely integrated control system free of signal incompatibilities.
   3. As a minimum, the Instrumentation Supplier shall perform the following WORK:
      a. Implementation of the PCIS
         1) prepare analog hardware submittals
         2) prepare the test plan, the training plan, and the spare parts submittals
         3) procure hardware
         4) oversee and certify hardware installation
         5) oversee, document, and certify loop testing
         6) prepare Technical Manuals
         7) prepare edited set of record drawings
   4. Any Instrumentation Supplier responsibilities in addition to the list above are at the discretion of the CONTRACTOR and the Instrumentation Supplier. Additional requirements in this Section and throughout Division 40 which are stated to be the CONTRACTOR's responsibility may be performed by the Instrumentation Supplier if the CONTRACTOR and Instrumentation Supplier so agree.

D. Control System Panel Designer and Fabricator
   1. Control System Panel Designer and Fabricator (CSPDF): The control system panel, and all other panels that have PLC hardware or communication hardware within them, shall be fabricated by the CSPDF. The CSPDF shall perform the following work:
      a. Edit contract loop drawings and control panel designs to show any and all changes to the design.

b. Fabricate and Test the panel(s) at the factory.
c. Ship the panel with a copy of the marked up drawings.

2. CSPDF Qualifications: The CSPDF shall have the resources, space, and personnel needed to design and fabricate the panels. The CSPDF shall meet the following minimum qualifications:
   a. The CSPDF shall have been in the business of building panels and bonding the construction of these panels for at least 5 years. The bonding shall be under the name and ownership of the company fabricating the panels for this project.
   b. The CSPDF shall build the panels to UL standard 508A, shall be certified to build panels to UL standard 508A, and shall attach a UL label on all new panels, or the panel builder shall build to an equal standard, shall be certified to an equal standard, and shall attach a label to all new panels with a label that is acceptable to the Municipality of Anchorage Building Department.
   c. The CSPDF shall make all wiring changes to new and existing control panels. The changes shall be made to UL standard 508, or equal standard that is acceptable to the Municipality of Anchorage Building Department. The CSPDF shall provide a UL engineer, or equal testing lab engineer that is acceptable to the Municipality of Anchorage Building Department, to inspect the changes and certify that the panel meets the standard, or provide a list of deficiencies.
3. The CSPDF shall be experienced with building AWWU Systems. Acceptable OEM Manufacturers include:
   a. TecPRO, Anchorage, Alaska
   b. Dowland-Bach, Anchorage, Alaska
   c. Technical Systems Inc, (TSI), Lynnwood, Washington

1.2 CONTRACTOR SUBMITTALS

A. Furnish submittals in accordance with MASS Section 10.05 Article 5.6 and the following:
   1. The CONTRACTOR shall coordinate the instrumentation work so that the complete instrumentation and control system will be provided and will be supported by accurate Shop Drawings and record drawings.
   2. Exchange of Technical Information: During the period of preparation of these submittals, the CONTRACTOR shall authorize a direct, informal liaison with the ENGINEER for exchange of technical information. As a result of this liaison, certain minor refinements and revisions in the systems as indicated may be authorized informally by the ENGINEER, but will not alter the scope of work or cause increase or decrease in the Contract Price. During this informal exchange, no oral statement by the ENGINEER shall be construed to give approval of any component or method, nor shall any statement be construed to grant exception to or variation from these Contract Documents.
   3. Symbology and Nomenclature: In these Contract Documents, all systems, all meters, all instruments, and all other elements are represented schematically, and are designated by symbology as derived from Instrument Society of America Standard ANSI/ISA S5.1 – Instrumentation Symbols and Identification. The nomenclature and numbers designated herein and on the Contract Drawings

shall be employed exclusively throughout Shop Drawings, and similar materials. No other symbols, designations, or nomenclature unique to the manufacturer's standard methods shall replace those prescribed above, used herein, or on the Contract Drawings.

B. Shop Drawings
   1. General
      a. Shop Drawings shall include the letterhead or title block of the Instrumentation Supplier. The title block shall include, as a minimum, the Instrumentation Supplier's registered business name and address, project name, drawing name, revision level, and personnel responsible for the content of the drawing. The quantity of submittal sets shall be as indicated in MASS Section 10.05 Article 5.6.
      b. Organization of the Shop Drawing submittals shall be compatible with eventual submittals for later inclusion in the Technical Manual.
      c. Shop Drawing information shall be bound in standard size, three-ring, loose-leaf, vinyl plastic, hard cover binders suitable for bookshelf storage. One set of drawings for each facility is to be hung inside the SCADA panel. The drawings are to be enclosed in PVC pockets suitable for hanging from a 3-ring binder, two drawings per pocket. The ring binder is to be attached to the inside of the front panel door.
      d. Interfaces between instruments, motor starters, control valves, variable speed drives, flow meters, chemical feeders and other equipment related to the PCIS shall be included in the Shop Drawing submittal.
   2. Analog Hardware Submittal: The CONTRACTOR shall submit an analog hardware submittal in electronic form and as a complete bound package at one time within 60 calendar days after the commencement date stated in the Notice to Proceed, including:
      a. A complete index which lists each device by tag number, type, and manufacturer. A separate technical brochure or bulletin shall be included with each instrument data sheet (original documents only – photocopies are not acceptable and will be rejected). The data sheets shall be indexed in the submittal by systems or loops, as a separate group for each system or loop. If, within a single system or loop, a single instrument is employed more than once, one data sheet with one brochure or bulletin may cover all identical uses of that instrument in that system. Each brochure or bulletin shall include a list of tag numbers for which it applies. System groups shall be separated by labeled tags.
      b. Fully executed data sheets according to ISA-S20 – Specification Forms for Process Measurement and Control Instruments, Primary Elements and Control Valves, for each component, together with a technical product brochure or bulletin. The technical product brochures shall be complete enough to verify conformance to all Contract Document requirements. The data sheets, as a minimum, shall show:
         1) Component functional description used in the Contract Documents
         2) Manufacturer's model number or other product designation
         3) Project tag number used in the Contract Documents
         4) Project system or loop of which the component is a part
         5) Project location or assembly at which the component is to be installed

6) Input and output characteristics
7) Scale, range, units, and multiplier (if any)
8) Requirements for electric supply (if any)
9) Requirements for air supply (if any)
10) Materials of component parts to be in contact with or otherwise exposed to process media and corrosive ambient air
11) Special requirements or features

c. Priced list of all spare parts for all devices.

d. Instrument installation, mounting, and anchoring details shall be submitted in an electronic hard copy format. Each instrument shall have a dedicated 8-1/2-inch by 11-inch detail which only pertains to the specific instrument by tag number. Each detail shall be certified by the instrument manufacturer that the proposed installation is in accordance with the instrument manufacturer's recommendations and is fully warrantable. These certifications shall be embedded in the CAD files and also appear as a stamp on the hard copies. As a minimum, each detail shall have the following contents:
1) Show all necessary sections and elevation views required to define instrument location by referencing tank, building or equipment names and numbers, and geographical qualities such as north, south, east, west, basement, first floor.
2) Process line pipe or tank size, service and material.
3) Process tap elevation and location.
4) Upstream and downstream straight pipe lengths between instrument installation and pipe fittings and valves.
5) Routing of tubing and identification of supports.
6) Mounting brackets, stands, and anchoring devices.
7) Conduit entry size, number, location, and delineation between power and signal.
8) NEMA ratings of enclosures and all components.
9) Clearances required for instrument servicing.
10) List itemizing all manufacturer makes, model numbers, quantities, lengths required, and materials of each item required to support the implementation of the detail.

3. Test Procedure Submittals
a. The CONTRACTOR shall submit the proposed procedures to be followed during tests of the PCIS and its components.
b. Preliminary Submittal: Outlines of the specific proposed tests and examples of proposed forms and checklists.

4. The CONTRACTOR shall provide a submittal of the CSPDF’s certifications, P.E. licenses, and project history before submitting any Shop Drawings or commencing any work on the control panels.

C. Technical Manual
   1. General: Information in the Technical Manual shall be based upon the approved Shop Drawing submittals as modified for conditions encountered in the field during the WORK.
   2. The Technical Manual shall have the following organization for each process:
      a. Section C – Edited As-Built Drawings
      b. Section D – Instrument Summary
      c. Section E – Instrument Data Sheets
      d. Section G – Instrument Installation Details
      e. Section H – Test Results
   3. Signed results from Loop Testing and FAT test.
   4. Initially, two sets of draft Technical Manuals shall be submitted for review after return of favorably reviewed Shop Drawings and data required herein. Following the ENGINEER's review, one set will be returned to the CONTRACTOR with comments. The Manuals shall be revised and amended as required and the final Manuals shall be submitted 15 days prior to start-up of systems.
   5. The CONTRACTOR shall provide Instrument Equipment Summary Forms for all instruments, PLC hardware, devices, control hardware, and miscellaneous equipment. The data shall be provided in electronic format, **Microsoft Excel**, or approved equal.

D. Record Drawings
   1. The CONTRACTOR shall keep current a set of complete loop and schematic diagrams which shall include all field and panel wiring, piping and tubing runs, routing, mounting details, point to point diagrams with cable, wire, tube and termination numbers. These drawings shall include all instruments and instrument elements. Two sets of drawings electronically formatted in AUTOCAD on CD-ROM and two hard copies shall be submitted after completion of all commissioning tasks. All such drawings shall be submitted for review prior to acceptance of the completed work by the OWNER.

1.3 WARRANTY

A. The warranty shall start from the date of final acceptance of the completed project, and shall extend for 1 year, in accordance with MASS Division 10.

PART 2 - PRODUCTS

2.1 GENERAL

A. Code and Regulatory Compliance: PCIS WORK shall conform to or exceed the applicable requirements of the National Electrical Code and local building codes.

B. Current Technology: Meters, instruments, and other components shall be the most recent field-proven models marketed by their manufacturers at the time of submittal of the Shop Drawings, unless otherwise required to match existing equipment.

C. Hardware Commonality: Instruments which utilize a common measurement principle (for example, d/p cells, pressure transmitters, level transmitters which monitor hydrostatic head) shall be furnished by a single manufacturer. Panel-mounted instruments shall have matching style and general appearance. Instruments performing similar functions shall be of the same type, model, or class, and shall be from a single manufacturer.

D. Loop Accuracy: The accuracy of each instrumentation system or loop shall be determined as a probable maximum error; this shall be the square root of the sum of the squares of certified "accuracies" of the designated components in each system, expressed as a percentage of the actual span or value of the measured variable. Each individual instrument shall have a minimum accuracy of plus and minus 2 percent of full scale and a minimum repeatability of plus and minus 1 percent of full scale when installed in the field, unless otherwise indicated. Instruments that do not conform to or improve upon these criteria are not acceptable.

E. Instrument and Loop Power: Power requirements and input/output connections for all components shall be verified. Power for transmitted signals shall, in general, originate in and be supplied by the control panel devices. The use of "2-wire" transmitters is preferred, and use of "4-wire" transmitters shall be minimized. Individual loop or redundant power supplies shall be provided as required by the manufacturer's instrument load characteristics to ensure sufficient power to each loop component. Power supplies shall be mounted within control panels or in the field at the point of application.

F. Loop Isolators and Converters: Signal isolators shall be provided as required to ensure adjacent component impedance match where feedback paths may be generated, or to maintain loop integrity during the removal of a loop component. Dropping precision wirewound resistors shall be installed at all field side terminations in the control panels to ensure loop integrity. Signal conditioners and converters shall be provided where required to resolve any signal level incompatibilities or provide required functions.

G. Environmental Suitability: Indoor and outdoor control panels and instrument enclosures shall be suitable for operation in the ambient conditions associated with the locations designated in the Contract Documents. Heating, cooling, and dehumidifying devices shall be provided in order to maintain all instrumentation devices 20 percent within the minimums and maximums of their rated environmental operating ranges. The CONTRACTOR shall provide power wiring for these devices. Enclosures suitable for the environment shall be furnished. All instrumentation in hazardous areas shall be suitable for use in the particular hazardous or classified location in which it is to be installed.

H. Signal Levels: Analog measurements and control signals shall be as indicated herein, and unless otherwise indicated, shall vary in direct linear proportion to the measured variable. Electrical signals outside control panels shall be 4 to 20 mA DC, except as indicated. Signals within enclosures may be 1 5 VDC. Electric signals shall be electrically or optically isolated from other signals. Pneumatic signals shall be 3 to 15 psig, with 3 psig equal to 0 percent, and 15 psig equal to 100 percent.

I. Alternative Equipment and Methods: Equipment or methods requiring redesign of any project details are not acceptable without prior written approval of the ENGINEER through the "or equal" process of MASS Section 10.05 Article 5.7. Any proposal for approval of alternative equipment or methods shall include evidence of improved performance, operational advantage and maintenance enhancement over the equipment or method indicated, or shall include evidence that an indicated component is not available. To match existing equipment and future equipment being installed under other contracts, equipment substitutions for equipment specified as no equal will not be accepted.

J. Instrument Brackets and Mounting Hardware: All instrument brackets and mounting hardware shall be stainless steel.

2.2 OPERATING CONDITIONS

A. The PCIS shall be designed and constructed for satisfactory operation and long, low maintenance service under the following conditions:

1.	Environment	-	water treatment/supply facility
2.	Indoor Temperature Range	-	32 through 84 degrees F
3.	Relative Humidity	-	20 through 90 percent, non-condensing
4.	Seismic Zone 4		

2.3 SPARE PARTS AND SPECIAL TOOLS

A. The CONTRACTOR shall provide the following:
   1. Spare parts as listed in equipment specifications in Division 40.

B. The CONTRACTOR shall furnish a priced list of all special tools required to calibrate and maintain the instrumentation provided under the Contract Documents. After approval, the CONTRACTOR shall furnish tools on that list.

C. Special tools and spare parts shall be submitted before startup commences, suitably wrapped and identified.

PART 3 - EXECUTION

3.1 PRODUCT HANDLING

A. Shipping Precautions: After completion of shop assembly, factory test, and approval, equipment, cabinets, panels, and consoles shall be packed in protective crates and enclosed in heavy-duty polyethylene envelopes or secured sheeting to provide complete protection from damage, dust, and moisture. Dehumidifiers shall be placed inside the polyethylene coverings. The equipment shall then be skid-mounted for final transport. Lifting rings shall be provided for moving without removing protective covering. Boxed weight shall be shown on shipping tags together with instructions for unloading, transporting, storing, and handling at the Site.

B. Special Instructions: Special instructions for proper field handling, storage, and installation required by the manufacturer shall be securely attached to each piece of equipment prior to packaging and shipment.

C. Tagging: Each component shall be tagged to identify its location, instrument tag number, and function in the system. A permanent stainless steel tag firmly attached and stamped with the instrument tag number, as given in the tabulation, shall be provided on each piece of equipment in the PCIS. Identification shall be prominently displayed on the outside of the package. Each HART device shall have the PID number programmed into smart HART protocol memory. The complete tag shall be the instrument drawing tag shown on the contract drawings.

D. Storage: Equipment shall not be stored outdoors. Equipment shall be stored in dry, permanent shelters, including in-line equipment, and shall be adequately protected against mechanical injury. If any apparatus has been damaged, such damage shall be repaired by the CONTRACTOR. If any apparatus has been subject to possible injury by water, it shall be thoroughly dried out and put through tests as directed by the ENGINEER. If such tests reveal defects, the equipment shall be replaced.

3.2 INSTALLATION

A. General
   1. Instrumentation, including instrumentation furnished under other Divisions, shall be installed under Division 40 and the manufacturers' instructions.
   2. Equipment Locations: The monitoring and control system configurations indicated are diagrammatic. The locations of equipment are approximate. The exact locations and routing of wiring and cables shall be governed by structural conditions and physical interferences and by the location of electrical terminations on equipment. Equipment shall be located and installed so that it will be readily accessible for operation and maintenance.

B. Conduit, Cables, and Field Wiring
   1. Conduit shall be provided under Division 26.
   2. Process equipment control wiring, 4-20 mA signal circuits, signal wiring to field instruments, PLC input and output wiring and other field wiring and cables shall be provided under Division 26.
   3. PLC equipment cables, Control Area Networks shall be provided under Division 40.
   4. Terminations and wire identification at PCIS equipment furnished under this or any other Division shall be provided under Division 40.

C. Instrumentation Tie-Downs: Instruments, control panels, and equipment shall be anchored by methods that comply with seismic requirements applicable to the Site.

D. Existing Instrumentation: Each existing instrument to be removed and reinstalled shall be cleaned, reconditioned, and recalibrated by an authorized service facility of the instrument manufacturer. The CONTRACTOR shall provide certification of this work prior to reinstallation of each instrument.

E. Ancillary Devices: The Contract Documents show all necessary conduit and instruments required to make a complete instrumentation system. The CONTRACTOR shall be responsible for providing any additional or different type connections as required by the instruments and specific installation requirements. Such additions and such changes, including the proposed method of installation, shall be submitted to the ENGINEER for approval prior to commencing the WORK. Such changes shall not be a basis of claims for extra work or delay.

F. Installation Criteria and Validation: Field-mounted components and assemblies shall be installed and connected according to the requirements below:
   1. Installation personnel have been instructed on installation requirements of the Contract Documents.
   2. Technical assistance is available to installation personnel at least by telephone.
   3. Installation personnel have at least one copy of the approved Shop Drawings and data.
   4. Instrument process sensing lines shall be installed under Section 22 11 19 – Piping and Tubing Systems.
   5. Flexible cables and capillary tubing shall be installed in flexible conduits. The lengths shall be sufficient to withdraw the element for periodic maintenance.
   6. Power and signal wires shall be terminated with crimped type lugs.
   7. Connectors shall be, as a minimum, watertight.
   8. Wires shall be mounted clearly with an identification tag that is of a permanent and reusable nature.
   9. Wire and cable shall be arranged in a neat manner and securely supported in cable groups and connected from terminal to terminal without splices, unless specifically approved by the ENGINEER. Wiring shall be protected from sharp edges and corners.
   10. Fasteners using adhesives are not permitted.
   11. Mounting stands and bracket materials and workmanship shall comply with requirements of the Contract Documents.
   12. Verify the correctness of each installation, including polarity of electric power and signal connections, and make sure process connections are free of leaks. The CONTRACTOR shall certify in writing that discrepancies have been corrected for each loop or system checked out.
   13. The OWNER will not be responsible for any additional cost of rework attributable to actions of the CONTRACTOR or the Instrumentation Supplier.

3.3 CALIBRATION

A. General: Devices provided under Division 40 shall be calibrated according to the manufacturer's recommended procedures to verify operational readiness and ability to meet the indicated functional and tolerance requirements.

B. Calibration Points: Each instrument shall be calibrated at 20, 60, and 100 percent of span using test instruments to simulate inputs. The test instruments shall have accuracies traceable to National Institute of Testing Standards.

C. Bench Calibration: Instruments that have been bench-calibrated shall be examined in the field to determine whether any of the calibrations are in need of adjustment. Such adjustments, if required, shall be made only after consultation with the ENGINEER.

D. Field Calibration: Instruments that were not bench-calibrated shall be calibrated in the field to ensure proper operation in accordance with the instrument loop diagrams or specification data sheets.

E. Analyzer Calibration: Each analyzer system shall be calibrated and tested as a workable system after installation. Testing procedures shall be directed by the manufacturers' technical representatives. Samples and sample gases shall be furnished by the manufacturers.

F. Calibration Sheets: Each instrument calibration sheet shall provide the following information and a space for sign-off on individual items and on the completed unit:
   1. Project name
   2. Loop number
   3. Tag number
   4. Manufacturer
   5. Model number
   6. Serial number
   7. Calibration range
   8. Calibration data: Input, output, and error at 20 percent, 60 percent and 100 percent of span
   9. Switch setting, contact action, and deadband for discrete elements
   10. Space for comments
   11. Space for sign-off by Instrumentation Supplier and date
   12. Test equipment used and associated serial numbers

G. Calibration Tags: A calibration and testing tag shall be attached to each piece of equipment or system at a location determined by the ENGINEER. The CONTRACTOR shall have the Instrumentation Supplier sign the tag when calibration is complete. The ENGINEER will sign the tag when the calibration and testing has been accepted.

3.4 LOOP TESTING

A. General: Individual instrument loop diagrams per ISA Standard S5.4 - Instrument Loop Diagrams, expanded format, shall be submitted to the ENGINEER for review prior to the loop tests. The CONTRACTOR shall notify the ENGINEER of scheduled tests a minimum of 30 days prior to the estimated completion date of installation and wiring of the PCIS. After the ENGINEER's review of the submitted loop diagrams for correctness and compliance with the Specifications, loop testing shall proceed. The loop check shall be witnessed by the ENGINEER.

B. Control Valve Tests: Control valves, cylinders, drives and connecting linkages shall be stroked from the operator interface units as well as local control devices and adjusted to verify proper control action, hand switch action, limit switch settings,

torque settings, remote control actions, and remote feedback of valve status and position. Control valve actions and positioner settings shall be checked with the valves in place to insure that no changes have occurred since the bench calibration.

C. Instrument and Instrument Component Validation: Each instrument shall be field-tested, inspected, and adjusted to its indicated performance requirement in accordance with manufacturer's specifications and instructions. Any instrument which fails to meet any Contract requirement, or, in the absence of a Contract requirement, any published manufacturer performance specification for functional and operational parameters, shall be repaired or replaced, at the discretion of the ENGINEER and at the CONTRACTOR’s expense.

D. Loop Validation: Controllers and electronic function modules shall be field-tested and exercised to demonstrate correct operation of the hardware and wiring. Control loops shall be checked under simulated operating conditions by impressing input signals at the primary control elements and observing appropriate responses at register in the PLC processor. Actual signals shall be used wherever available. Following any necessary corrections, the loops shall be retested.

E. Loop Validation Sheets: The CONTRACTOR shall prepare loop confirmation sheets for each loop covering each active instrumentation and control device including simple hand switches and lights. Loop confirmation sheets shall form the basis for operational tests and documentation. Each loop confirmation sheet shall cite the following information and shall provide spaces for sign-off on individual items and on the complete loop by the Instrumentation Supplier:
   1. Project name
   2. Loop number
   3. Tag number, description, manufacturer and model number for each element
   4. Installation bulletin number
   5. Specification sheet number
   6. Adjustment check
   7. Space for comments
   8. Space for loop sign-off by Instrumentation Supplier and date
   9. Space for ENGINEER witness signature and date

F. Loop Certifications: When installation tests have been successfully completed for all individual instruments and all separate analog control networks, a certified copy of each test form signed by the ENGINEER or the ENGINEER's representative as a witness, with test data entered, shall be submitted to the ENGINEER together with a clear and unequivocal statement that the instrumentation has been successfully calibrated, inspected, and tested.

3.5 RADIO SYSTEM TEST

A. Two measurements are to be made during the initial installation. They will confirm proper operation of the unit and serve as a benchmark in troubleshooting should difficulties appear in the future. These measurements must be performed by a skilled

radio-technician and are: Antenna System SWR (Standing-Wave Ratio), and Antenna Direction Optimization, as defined below.

B. Antenna System SWR and Transmitter Power Output

1. General: A proper impedance match between the MDS Orbits Series radio and the antenna system is important. It ensures the maximum signal transfer between the radio and antenna. The impedance match can be checked indirectly by measuring the SWR of the antenna system. If the results are normal (as defined in the next paragraph), record them for comparison for use during future routine preventative maintenance. Abnormal readings indicate possible trouble with the antenna or the transmission line that must be corrected and the test then repeated.

   The SWR of the antenna system is to be checked before the radio is put into regular service. For accurate readings, a wattmeter suited to 1000 MHz measurements is required. One unit meeting this criterion is the **Bird Model 43** directional wattmeter with a **5J** element installed. The reflected power must be less than 10 percent of the forward power (≈2:1 SWR).

   If the reflected power is more than 10 percent, check the feedline, antenna and its connectors for damage and repair or replace as necessary.

   Set the transmitter power output level to 30 dBm for the duration of the test to provide an adequate signal level for the directional wattmeter.

2. Use the following Microwave Data Systems recommended test procedure:
   a. Place a directional wattmeter between the ANTENNA connector and the antenna system.
   b. Place the MDS unit into the Radio Test Mode.
   c. Set the transmitter power to 30 dBm and turn on the radio transmitter.
   d. Measure the forward and reflected power into the antenna system and calculate the SWR and power output level. The output should agree with the programmed value.

C. Antenna Direction Optimization

1. General: Directional antennas require some fine-turning of their bearing to optimize the received signal strength. The MDS radio has a built-in received signal strength indicator (RSSI) that is to be used to tell when the antenna is in a position that provides the optimum received signal.

   RSSI measurements and Wireless Packet Statistics are based on multiple samples over a period of several seconds. The average of these measurements will be displayed by the radio Management System.

   The measurement and antenna alignment process is expected to take 10 or more minutes.

2. Use the Microwave Data Systems recommended test procedure.
   a. Optimize RSSI (less negative is better) by slowly adjusting the direction of the antenna. Watch the RSSI indication for several seconds after making each adjustment so that the RSSI accurately reflects any change in the link signal strength.
   b. View the Wireless Packets Dropped and Received Error rates at the point of maximum RSSI level. They should be the same or lower than the previous

reading. (Main Menu>Performance Information>Packet Statistics>Wireless Packet Statistics)

3.6 PERFORMANCE TEST

A. The entire PCIS hardware, field instruments, power supplies, and wiring shall operate for 30 days without failure.

B. The CONTRACTOR shall furnish support staff as required to satisfy the repair or replacement requirements.

C. If any component, other than field instruments, fails during the performance test, it shall be repaired or replaced and the PCIS shall be restarted for another 30-day period.

3.7 REQUIREMENTS FOR SUBSTANTIAL COMPLETION

A. For the purpose of this Section, the following conditions, in addition to the requirements in MASS Division 10, shall be fulfilled before the WORK is considered substantially complete:
   1. Submittals have been completed and approved.
   2. The PCIS has been installed, calibrated, and loop tested.
   3. Spare parts and expendable supplies and test equipment have been delivered to the ENGINEER.
   4. The performance test has been successfully completed.
   5. Punch-list items have been corrected.
   6. Record drawings in both hard copy and electronic format have been submitted.
   7. Revisions to the Technical Manuals that may have resulted from the field tests have been made and reviewed.
   8. Debris associated with installation of instrumentation has been removed.
   9. Probes, elements, sample lines, transmitters, tubing, and enclosures have been cleaned and are in like-new condition.
   10. Instrument Equipment Summary Forms have been accepted by the OWNER.

END OF SECTION 40 90 00

SECTION 40 91 19.29 – PRESSURE MEASURING SYSTEMS

PART 1 - GENERAL

1.1 THE REQUIREMENT

A. General: The CONTRACTOR shall provide pressure measuring systems, complete and operable, in accordance with the Contract Documents.

B. The requirements of Section 40 90 00 – Process Control and Instrumentation Systems apply to the WORK of this Section.

C. All instruments shall be FM-approved, or equal.

1.2 SUBMITTALS

A. General: Shop Drawings, Owner's Manual, and Record Drawings shall be submitted in conformance with the requirements of Section 40 90 00 – Process Control and Instrumentation Systems, and MASS Section 10.05 Article 5.6.

PART 2 - PRODUCTS

2.1 GENERAL

A. Electrical interface and code compliance shall conform to the requirements of Section 40 90 00 – Process Control and Instrumentation Systems.

2.2 ELECTRONIC PRESSURE TRANSMITTERS

A. Components: Electronic gauge and differential pressure transmitters shall consist of a capsule assembly, process connector and connection, amplifier unit, integral indicator, terminal box with cover, block and bleed valves, and conduit connections. Process connection shall be 1/2” NPT. Each transmitter installation shall include a manifold system and gauge as shown on the drawings. Process sensing lines shall be 1/4-inch stainless steel tubing.

B. Operating Principles: Pressure applied to the unit shall be transmitted to a sensing diaphragm made of ceramic sensor or polysilicone. Performance Requirements are:
   1. The amplifier unit shall convert the change in capacitance to a 4-20 mA DC signal, 2-wire type, with an allowable loop load of no less than 600 ohms.
   2. Static pressure rating shall be a minimum of 600 psig.
   3. The maximum over range pressure limit shall be a minimum of 150 percent of the minimum range.
   4. Span shall be adjustable over a minimum of 5:1 range.
   5. Damping shall be provided as an internal adjustment.

6. All equipment shall be suitable for an ambient operating range of minus 40 degree F to plus 100 degrees F.
7. Integral indicators shall be calibrated in process units.
8. Power supply shall be 24 VDC, loop powered.
9. Accuracy, including linearity and repeatability, shall be a plus or minus 0.2 percent of span.
10. Any solution in the probe shall be food grade.

C. Materials: All wetted parts shall be constructed of 316 stainless steel. Exposed parts shall be stainless steel or aluminum with polyurethane coating.

D. The devices shall be smart devices that can be calibrated with a **Fluke 744 HART protocol calibrator**.

E. Pressure transmitter housing shall be rated for NEMA 4X.

F. Manufacturer's Gauge Pressure Transmitters: **Rosemount Model 2088**, or equal.

2.3 PROCESS PRESSURE GAUGE

A. Components: Process pressure gauges shall consist of a solid front safety case with shatter proof glass. Class shall be liquid filled. Pointer shall be micrometer adjustable. Process connection shall be 1/2" NPT. Process sensing lines shall be 1/4-inch stainless steel tubing with isolation valves and blowoff for cleaning.

B. Operating Principles: Process pressure gauges shall be ANSI/ASME B40.1, Grade 2A (plus or minus 0.5 percent of full scale accuracy), dial range approximately twice the anticipated working pressure.

C. Materials: All wetted parts shall be constructed of 300 series stainless steel.

D. Manufacturer's Process Pressure Gauge: **Ashcroft Type 1259**, or equal.

2.4 WAFER ISOLATION RING

A. Components: Isolation rings are designed to protect measuring devices from direct contact with the process media. Wafer isolation rings shall consist of a sensing flexible inner-liner in a housing mounted between the flanges of the process piping. Transmitter connection shall be 1/2" NPT.

B. Materials: Flange material shall be 316L stainless steel. Flexible liner shall be constructed of the manufacturer recommended material for domestic wastewater (Buna). Fill fluid shall be the manufacturer recommended material for domestic wastewater (Glycerin).

C. Calibration: Isolation rings shall be filled with fluid and calibrated with pressure transmitter by the manufacturer. The calibrated rings shall be shipped as a single

unit for the Contractor to install. In no case should the Contractor attempt to install the fill fluid without a manufacturer representative onsite.

D. Manufacturer's Wafer Isolation Ring: **Ashcroft 80**, or equal.

2.5 BLEED RING

A. Components: Bleed rings (or drip rings) are placed inside the circular bolts between flanges, mainly to drain or bleed off excess air, via a valve. Connection shall be 1/2" NPT.

B. Materials: Material shall be 316L stainless steel.

2.6 ELECTRONIC ACTUATED PILOT CONTROL

A. Electronic actuated pressure reducing or pressure sustaining pilot control is required to be retrofitted to existing hydraulic operated valves to allow remote setpoint change. Performance requirements are:
   1. Pressure reducing or sustaining control is to be achieved by utilizing a hydraulic pilot with integral controller that accepts a 4-20 mA remote setpoint to precisely position the pilot within a predetermined zero and span setting.
   2. Set minimum spring range adjustment at 4 mA and maximum of 20 mA. Pressure settings are to be linear between these values.
   3. Operate on 24 VDC and consume less than 100 mA underload (occurring only during setpoint change) and 25 mA at no load.
   4. Continuous internal monitoring of actuator position is to be used to ensure accurate pressure changes with no backlash or dithering. Built-in electronic limits are to be used to prevent over ranging.
   5. In the event of a power or control input failure, the pilot is to remain in last position.
   6. The electronic actuated pilot control shall have an integral hydraulic pilot and electronic controller contained in a NEMA 4X enclosure to provide interface between remote telemetry and valve setpoint control.
   7. The actuator will compare a remote analog command signal with an internal position sensor signal and adjust the hydraulic pilot control spring mechanism to a new setpoint position.
   8. The actuator speed will be field adjustable to less than 1 RPM with a range of 2 turns centered on the operating range or setpoint. The range shall be field adjustable from 1 to 7 turns.
   9. If the Remote Setpoint signal is lost or power fails, the valve shall remain under control of the pressure reducing hydraulic control sub-assembly.
   10. No adjustments shall be necessary to the actuator except to the low and high position range adjustment.
   11. The electronic actuated pressure reducing pilot control shall be **Cla-Val Model CRD-32**, or equal.
   12. Provide (4) programming cables and PC software for field adjustments and firmware upgrades.

13. Provide one spare electronic actuator.

PART 3 - EXECUTION

3.1 GENERAL

A. Pressure measuring and control systems shall be handled, installed, calibrated, loop-tested, commissioned, and performance tested according to Section 40 90 00 – Process Control and Instrumentation Systems.

B. Mounting hardware and sensing lines shall be stainless steel in accordance with Section 22 11 19 – Stainless Steel Piping and Tubing Systems.

END OF SECTION 40 91 19.29

SECTION 40 95 00 – PAC-BASED CONTROL SYSTEMS HARDWARE

PART 1 - GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR, through the use of the Instrumentation Supplier and qualified electrical installers, shall provide and install the PAC-based control system (PACS) hardware complete and operable, in accordance with the Contract Documents.

B. Instrumentation Supplier: It is the intent of these Specifications to have the Instrumentation Supplier be singularly responsible for selecting, and verifying, correct operation of compatible hardware to provide a functional PACS and to provide future support of all PACS hardware.

C. Minimum Instrumentation Supplier Scope: The exact contractual relationship and scope definition shall be established exclusively between the CONTRACTOR and the Instrumentation Supplier. It is the intent of these Specifications that the Instrumentation Supplier, under the direction of the CONTRACTOR, shall assume full responsibility for the following, as a minimum:
   1. Procurement of all hardware required to conform to these Specifications.
   2. Design and submit PACS hardware, and spare parts submittals.
   3. Perform all required PACS hardware tests, adjustments, and calibrations.
   4. Furnish all required PACS tools, test equipment, spare parts, supplies, operations and maintenance manuals, and reproducible record drawings as specified herein.

1.2 SUBMITTALS

A. Shop Drawings: PACS hardware submittals shall be in accordance with the applicable requirements of Section 40 90 00 – Process Control and Instrumentation Systems. PACS submittals shall, however, be made separately from other process control and instrumentation system submittals.

B. Hardware Submittals: The PACS hardware submittal shall be a single submittal which includes at least the following:
   1. A complete index appearing in the front of each bound submittal volume. System groups shall be separated by labeled tags.
   2. Complete grounding requirements for the entire PACS, including any requirements for PACS communication networks and control room equipment.
   3. Data sheets shall be included for each PACS component together with a technical product brochure or bulletin. These data sheets shall show the component name as used within the Contract Documents, the manufacturer's model number or other identifying product designation, the project tag number, the project system of which it is a part, the Site to which it applies, the input and output characteristics, the requirements for electric power, the ambient operating condition requirements, and details on materials of construction.

4. Complete and detailed bills of materials: A bill of material list, including quantity, description, manufacturer, and part number, shall be submitted for each component of the PACS system. Bills of material shall include all items within an enclosure.

C. Owner's Manuals: General requirements for Owner's Manuals are as described in Section 40 90 00 – Process Control and Instrumentation Systems. The following items shall also be included in the PACS manual:
   1. Operation and maintenance manuals for both the PACS, and all other PACS hardware.

D. Factory Test Procedure: The Instrumentation Supplier shall prepare and submit a factory test procedure which incorporates test sequences, test forms, samples of database lists, a PACS testing block diagram, and an estimated test duration which comply with the requirements of the factory test specified herein.

1.3 SERVICES OF MANUFACTURER'S REPRESENTATIVE

A. The CONTRACTOR/Instrumentation Supplier shall arrange for visits by, and services of, technical field representatives of the PAC manufacturer for installation certification, system testing, and start-up. These services shall be part of the WORK.

1.4 STORAGE AND HANDLING

A. All equipment and materials delivered to the Site shall be stored in a location that shall not interfere with the operations of the OWNER's personnel or interfere with construction. Storage and handling shall be performed in a manner that shall afford maximum protection to the equipment and materials. It is the CONTRACTOR's responsibility to assure proper handling and on-site storage.

1.5 SPECIAL WARRANTY REQUIREMENTS

A. Equipment and materials selected by the CONTRACTOR that do not achieve design requirements after installation shall be replaced or modified by the Instrumentation Supplier to attain compliance. The cost for doing so shall be the CONTRACTOR's responsibility. Following replacement or modification, the CONTRACTOR shall retest the system and perform any additional procedures needed to place the complete PACS in satisfactory operation and attain design compliance approval from the ENGINEER.

B. The CONTRACTOR warrants/guarantees the satisfactory performance of the equipment and materials under operating conditions for a period of 1 year after the date of final acceptance of the entire PACS. In the event that tests and inspections disclose latent defects or failure to meet the specified requirements, the Instrumentation Supplier, upon notification by the OWNER, shall proceed at once to correct or repair any such defects or non-conformance or to furnish, at the delivery point named in the Contract Documents, such new equipment or parts as may be necessary for conformity to the requirements, and shall receive no additional

compensation therefore. In case of any required repairs or other corrective or remedial work covered under warranty, the warranties on all such corrections, repairs, new equipment, or parts shall be extended for an additional 24 months from the date of final acceptance, or 12 months from the date of completion of any such corrections, repairs, new equipment, or parts, whichever date is later. If the OWNER performs repair, the CONTRACTOR shall reimburse the OWNER for all costs incurred in the removal of the defective material and installation of the replacement.

PART 2 - PRODUCTS

2.1 GENERAL

A. The requirements of Section 40 90 00 – Process Control and Instrumentation Systems apply to this Section.

B. All materials and all PACS equipment furnished under this Contract shall be new, free from defects, of first quality, and produced by manufacturers regularly engaged in the manufacture of these products.

C. Hardware Commonality: Where there is more than one item of similar equipment being furnished all such similar equipment shall be the product of a singular manufacturer.

2.2 PACS ENCLOSURES

A. Each PAC and its corresponding I/O modules, power supply module(s), communication interface device(s), peripheral equipment, and radio communications shall be mounted inside suitable enclosures. All I/O wiring from the field to the I/O modules shall be terminated on terminal blocks in the enclosure.

2.3 UNINTERRUPTIBLE DC POWER SUPPLY

A. Provide and install battery supported DC power supplies of the size, number, and location as shown on the Drawings.

B. The DC power supply shall be per Section 26 33 05 – DC Power Supply Battery Charger.

2.4 PROGRAMMABLE AUTOMATION CONTROLLER (PAC)

A. General: Each PAC shall be of solid-state design. All central processor (CPU) operating logic shall be contained on plug-in modules for quick replacement. Chassis-wired logic is not acceptable. The controller shall be capable of operating in a hostile industrial environment and designed to provide high reliability specifically in this process application. The internal wiring of the controller is to be fixed, with the logic functions it must perform in a given application to be programmed into its memory. The controller shall be supplied with the CPU, input/output scanner, inputs,

outputs, memory, power supply, and all power and interface cables necessary to function as a complete and operable PAC system.

B. Design: Each PAC shall have all of the facilities required to implement the control schemes and database indicated. PACS shall have the following functions and features:
   1. Modular, field-expandable design allowing the system to be tailored to this process control application. The capability shall exist to allow for expansion of the system by the addition of hardware and/or user software.
   2. The processor plus input and output circuitry shall be of a modular design with interchangeability provided for all similar modules. Modules are defined herein as devices that plug together to form an interlocking modular chassis. The design must prohibit upside-down insertion of the modules.
   3. The PAC shall have downward compatibility whereby all new module designs can be interchanged with all similar modules in an effort to reduce obsolescence.
   4. All hardware shall operate at an ambient temperature of 0 to 60 degrees C (32 to 140 degrees F), with an ambient temperature rating for storage of - 40 to + 85 degrees C (- 40 to + 185 degrees F), and shall function continuously in the relative humidity range of 5 percent to 95 percent with no condensation. The PAC system shall be designed and tested to operate in the high electrical noise environment of an industrial plant.
   5. The PAC shall provide a means for mounting the chassis in a standard cabinet.

C. Central Processors: The CPU shall contain all the relays, timers, counters, number storage registers, shift registers, sequencer, arithmetic capability, and comparators necessary to perform the indicated control functions. It shall be capable of interfacing sufficient discrete inputs, analog inputs, discrete outputs, and analog outputs as shown on the drawings. The Processor shall be an **Allen Bradley ControlLogix 1756-L73**, as shown on the Drawing, no exceptions, to match AWWU equipment at other AWWU facilities. The CPU shall be supplied with a 1GB **SecureDigital card Allen-Bradley 1784-SD1**, or equal. The PACS shall have the following features and capabilities:
   1. All PACS shall be provided to support and implement closed loop floating and PID control which is directly integrated into the PAC's control program.
   2. The CPU shall be a self-contained unit, and shall provide control program execution and support remote or local programming. This device shall also supply I/O scanning and inter-processor and peripheral communication functions.
   3. The operating system shall be contained in removable programmable devices which allow for easy field replacement.
   4. The CPU within the system shall perform internal diagnostic checking and give visual indication to the user by illuminating a "green" indicator when no fault is detected and a "red" indicator when a fault is detected.
   5. Non-volatile memory shall store the operating system information to protect against loss in the case of power loss or system shut-down. Only at the time of a hardware change shall this configuration status be altered or re-entered.
   6. The PAC shall have the ability to fit into Rockwell’s Factory Talk Directory’s Security Application and participate in the Rockwell Asset Center Disaster Recovery Program.

D. Program Creation and Storage (Memory)
   1. The program storage medium shall be of a static RAM type.
   2. The PAC system shall be capable of addressing up to 2MB, where each word is comprised of 8 data bits.
   3. Memory capacity shall be configurable to allow for the most economical match to the intended application. It shall be possible to upgrade to a processor with a larger memory size simply by saving a program, replacing the processor, and downloading the program to the new system without having to make any program changes.
   4. Memory shall be capable of retaining all stored program data through a continuous power outage for 4 months under worst case conditions. A low battery condition must be detectable in ladder logic, but shall not automatically generate a major fault.
   5. All user memory in the processor not used for program storage shall be allocatable from main memory for the purpose of data storage. The PAC system shall be capable of storing the following data types:
      a. External Output Status
      b. External Input Status
      c. Timer Values
      d. Counter Values
      e. Signed Integer Numbers (16-bit)
      f. Floating Point Numbers
      g. Decimal Numbers
      h. Binary Numbers
      i. BCD Numbers
      j. Direct and Indexed Addressing
      k. Internal Processor Status Information
      l. ASCII Character Data
      m. ASCII String Data
      n. Block Transfer Control Structures
      o. Floating Point PID Control Structures
      p. File Instruction Control Structures
      q. Message Control Structures
   6. Control logic programs shall have immediate access to the sub-elements of control structures by address and sub-element mnemonic, such as timer accumulator value, timer done bit, or PID Process Variable value.
   7. Each unit shall be supplied with memory to implement the indicated control functions. The memory shall be programmed in a multi-mode configuration with multiple series or parallel contacts, counters, timers, and arithmetic functions.

E. Programming Techniques: The ENGINEER and OWNER shall program the PACS.

F. Ethernet Interface and Network
   1. The PAC system shall offer industry standard Ethernet TCP/IP communication capabilities. The controller shall be able to connect to industry standard 100baseT media types by implementing a standard RJ-45 transceiver port that can connect to different transceivers. There shall be a CIP protocol layer that

uses TCP/IP as the transport mechanism to deliver packets of data to other PACS that use the same protocol. This protocol handles the addressing and transfer of all the specific data file types in the PAC to allow for peer-to-peer messaging.

a. Token passing system.
b. Peer-to-peer communication.
c. Message error checking.
d. Retries of unacknowledged messages.
e. Diagnostic checks on other stations.
f. Interface to more than one network.
g. A user-oriented command language for manipulation of data structures of variable size and organization, such as setting or resetting bits, word and file transfers in a peer processor.
h. The ability to perform PAC memory uploads and downloads.
i. The ability to communicate with all other models of PAC manufactured by said manufacturer.
j. The ability to monitor the status of any processor remotely via the network.
k. The ability to automatically broadcast data to (and receive data from) all compatible stations on the link. Once configured, this operation shall be continuous without operator intervention.
l. A gateway interface to the Ethernet TCP/IP network for connectivity to host computers as well as other PACS that have direct Ethernet connectivity

2. The PAC system shall allow industry standard repeaters, bridges, routers, and gateways on the network in order to access other PACS and host computers. The controller shall be able to name a specific gateway/router IP address in order to direct data to other networks.
3. On-line programming and upload/downloads of control programs shall be able to occur over the Ethernet network.

G. PAC Power Supply

1. The PAC shall operate in compliance with an electrical service of 24 VDC. The power supply shall be mounted in the PAC housing and be sized to power all modules mounted in that housing and an "average module load" for any empty housing slots plus 25 percent above that total. Power supply shall be by the same manufacturer as the PAC and shall be of the same product line. A single main power supply shall have the capability of supplying power to the CPU and local input/output modules. Auxiliary power supplies shall provide power to remotely located racks.
2. The power supply shall be **Allen-Bradley 1756-PB75**, no exceptions to the model shown on the Drawings.

H. PAC Input/Output (I/O) Modules

1. I/O Modules General: All I/O housings and modules shall be suitable for hostile industrial environments. All I/O modules shall be isolated and conform to IEEE Surge Withstand Standards and NEMA Noise Immunity Standards. The I/Os shall be 4-20 mA DC for all analog inputs and outputs and shall be 24 VDC for discrete inputs and dry relay contacts for safe discrete outputs. Each PAC I/O

location shall contain the I/O module quantity and type as shown on the Drawings.

2. Discrete Input Modules with Diagnostics: Defined as contact closure inputs from devices external to the programmable controller module. Individual inputs shall be optically isolated from low energy common mode transients to 1500 volts peak from users wiring or other I/O modules. Input modules shall be **Allen-Bradley 1756-IB16**, unless noted on the Drawings.
   a. DC input for devices that operate at 5 to 30 VDC.
3. Discrete Output Modules with Electronic Fuse: Defined as contact closure outputs for ON/OFF operation of devices external to the programmable controller module. The output modules shall be optically isolated from inductively-generated, normal mode and low energy, common mode transients to 1500 volts peak. Discrete output contacts shall be provided with interposing relays in the control panel. Output modules shall be **Allen-Bradley 1756-OB16**, unless noted on the Drawings.
   a. DC output for devices that operate at 10 to 30 VDC.
4. Analog Input Modules: Defined as 4 to 20 mA DC signals, where an analog to digital conversion is performed with 14-bit precision and the digital result is entered into the processor. The analog to digital conversion shall be updated with each scan of the processor. Input modules shall be source or sink to handle 2-wire or 4-wire transmitters, respectively. Input modules shall be **Allen-Bradley 1756-IF16**, unless noted otherwise on the Drawings.
5. Analog Output Modules: Not used.
6. RTD Input Modules: Analog Resistive Temperature Device (RTD) modules shall be provided where shown on the drawings. RTD Input modules shall be **Allen-Bradley 1756-IR12,** unless noted otherwise on the Drawings.

I. PAC Rack Configuration: The PAC, power supply, and I/O modules shall be mounted in the Rack configurations as shown on the drawings. Space is to be provided for future expansion of the racks in keeping with Allen-Bradley guidelines.

J. Operator Interface: A color, touch sensitive, Operator Interface is to be provided where called for on the Plans. The unit is to be supplied at 24 VDC and is to communicate to the PAC via an Ethernet interface. The Operator Interfaces shall be **Allen-Bradley model Panel View Plus 2715P-T12WD** no exception.

2.5 NETWORK HARDWARE

A. All unshielded twisted pair cabling shall be rated EIA/TIA 568 category 6A for plenum space.

B. Ethernet Radio: Radio shall be **MDS Orbits Series Ethernet remote**, configured from the factory for multiple endpoints and network management, no exception. Radios must communicate with existing AWWU MDS poling master radios and no substitutions will be accepted. Mounting shall be done with a **MDS 35 mm DIN Rail Mounting Bracket (Part No. 03-4022A02)**.

C. Antenna: Antenna shall be 10 dB gain Yagi antenna, **MDS Clearwave**, or equal.

1. Existing Yagi antenna to remain for re-use.
2. New LTE Antenna: Owner provided, Contractor installed, directional LTE antenna. New LTE antenna shall be mounted to the existing antenna mast; installation shall be planned and coordinated with the OWNER and ENGINEER a minimum of two (2) weeks prior to installation.

D. High Gain Panel Antennas: The antennas shall have a gain of USLS 18 db at 910 MHz, with a polarization of ± 45 degrees, a front-to-back ratio of 34 db or higher, a VSWR 1.4:1 or better, and a wind rating of 125 mph. The unit shall be equipped with a weather shield, DIN connector, lightning protection, and mounting hardware for the antenna pole shown on the drawings. The antenna shall be a **Decibel model LBX-3316DS-TOM**, or equal.

E. The CONTRACTOR shall provide all antennas, coax cables and fittings as shown on the Drawings, unless noted otherwise. The Coax cable shall be as specified in Section 26 05 19 and shall not be spliced. The cable and all fittings shall be weatherproof.

F. Ethernet Switch: The switch shall be compact size and designed to mount to DIN rail, be 10Base-T/100Base-TX compliant, be Auto sensing full and half duplex, have number of ports as shown or as required, and have a UL 508 listing. The power supply shall be 8 VDC to 24 VDC. The switch shall support Device Level Ring network architecture. The switch shall be **STRATIX 5700**, or equal. The ENGINEER has tested this switch and is satisfied that it will function in the SCADA system as intended.

G. EtherNet / IP Distributed I/O Module: **Allen-Bradley-EN2TR I/O Module.**

2.6 SPARE PARTS

A. Provide one card, power supply, radio, and switch of each type as required to be installed in the SCADA panel.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The CONTRACTOR shall utilize qualified personnel to accomplish, or supervise the physical installation of all elements, components, accessories, or assemblies that it provides. The CONTRACTOR shall employ installers who are skilled and experienced in the installation and connection of all elements, components, accessories, and assemblies it provides.

B. All components of the PACS, including all communication cabling, shall be the installation responsibility of the CONTRACTOR unless specifically noted otherwise. The installation of the communication network shall be the complete installation responsibility of the CONTRACTOR, including all cables, connectors, transceivers, antennas, and any required electrical grounds. Grounding shall be shown on

submittal drawings. After installation of the PACS is completed, the installation shall be inspected jointly by the CONTRACTOR and the Equipment Manufacturer's representatives. Any problems shall be corrected, and when both are satisfied with the installation, a written certification of the installation shall be delivered to the ENGINEER. The certification shall state that all PAC communication and I/O modules, modems, system grounds, communication network, and all other components of the PACS System have been inspected and are installed in accordance with the Manufacturer's guidelines.

3.2 FACTORY TEST

A. General: Prior to shipment of the PACS from the factory, but after the procurement, assembly, and configuration of all components, the CONTRACTOR shall conduct a factory test on the panel fabricator shop floor. This test shall be witnessed by a representative of the OWNER and the ENGINEER of record, at the place of fabrication. No PACS shall be shipped without the ENGINEER's written approval of the factory test. The factory test is intended to be a complete PACS. The factory test shall demonstrate the functionality and performance of specified features of the PAC. The test shall include verification of all radios, PACS, and remote I/O system I/O points. Each point shall be checked from the terminal strip to register in the PAC processor. A complete system checklist shall be available during the test for recording results of selected points. **A minimum of ten (10) working days** notification shall be provided to the ENGINEER and ENGINEER of record prior to testing.

B. Test Setup: The complete PACS system as shown on the drawings shall be assembled and interconnected on the CONTRACTOR's factory floor. The system shall include communication cable segments for the LANs, an Ethernet switch provided by the CONTRACTOR, and the radios to simulate as closely as possible the eventual Site installation. The PACS and communication devices shall be loaded with their applicable software packages. PAC input and output modules shall be installed in their assigned housings and wired to field termination points in the enclosures. The CONTRACTOR shall have a complete, up-to-date set of wiring drawings and a PAC register list for the test point, for review throughout the test.

C. The CONTRACTOR shall schedule the factory test after receiving approval of the factory test procedures submittal. One test shall be conducted for the complete system. A minimum of five 8-hour days will be budgeted for the test. The CONTRACTOR shall provide a qualified technician to assist with testing for the entire duration of the factory test.

D. Test Procedure: The factory test shall be conducted in accordance with the previously submitted and approved test procedures. The test procedures shall include written descriptions of how individual tests shall be performed and shall incorporate testing the following features as a minimum. All testing shall be completed in one continuous factory test which shall extend over 5 continuous days.
   1. Power Failure: External power to enclosures and/or workstations shall be turned off and back on in order to test the operation of the DC battery back-up system.

2. The panel fabricator shall provide one technician for the 5 days of the test to assist the ENGINEER in testing the panel.

E. Test Report: The CONTRACTOR shall record the results of all factory testing on preapproved test forms which the OWNER's and ENGINEER's representatives shall sign. A copy of the completed test forms and a report certifying the results shall be provided to the ENGINEER within 10 days of completing the test.

F. Rework and Retest: If the PACS does not operate as required, the CONTRACTOR shall make whatever corrections are necessary, and the failed part of the tests shall be repeated. If, in the opinion of ENGINEER's representative, the changes made by the CONTRACTOR for such a correction are sufficient in kind or scope to effect parts of system operation already tested, then the effected parts shall be retested also. If a reliable determination of the effect of changes made by the CONTRACTOR cannot be made, then the ENGINEER's representative may require that all operations be retested. The CONTRACTOR shall bear all of its own costs for the factory test, including any required retesting.

G. All of the travel and per diem costs for factory testing and retesting shall be borne by the CONTRACTOR.
   1. For factories within a 50-mile radius of the project site, no travel or per diem costs will be charged by the OWNER’s representative and ENGINEER of record.
   2. For factories outside of a 50-mile radius of the project site, the CONTRACTOR shall pay air travel costs, vehicle rental costs, lodging, and meals, for two people for the duration of each visit required to witness the factory tests. The vehicle rental, lodging, and meal allowance shall be $225 per person per day.

3.3 CALIBRATION, TESTING, AND INSTALLATION

A. Calibration: All analog inputs and outputs of the PAC shall have their calibration checked at a minimum of two points to verify consistency with the balance of the analog loop. This calibration check shall be done in conjunction with the analog loop tests in Section 40 90 00 – Process Control and Instrumentation Systems. Operator Interfaces and PAC registers shall both be verified for correctness.

B. The CONTRACTOR shall submit to the ENGINEER a system testing completion report when each process system and all aspects of the configuration software have been successfully tested as described herein. The report shall note any problems encountered and what action was required to correct them. It shall include a clear and unequivocal statement that the process systems have been thoroughly tested and are complete and functional in accordance with all Specification requirements.

END OF SECTION 40 95 00

SECTION 40 95 13 – CONTROL PANELS

PART 1 - GENERAL

1.1 THE REQUIREMENT

A. General: The CONTRACTOR shall provide control panels, complete and operable, in accordance with the Contract Documents.

B. The requirements of Section 40 90 00 – Process Control and Instrumentation Systems apply to this Section.

C. The provisions of this Section apply to local panels provided in equipment systems specified in other sections, unless indicated otherwise in those sections.

D. Control and SCADA panels shall be built to UL 508A, or an independent testing laboratory acceptable to the local code enforcement agency having jurisdiction. The panels shall have UL labels attached to them by the panel builder. The panel builder shall provide with each panel a certification from the independent testing lab inspector that the panel is built to their standards.

E. Panels equipped with Intrinsically Safe controls shall also bear UL 913 label in addition to the UL 508A label.

F. SCADA enclosures and power panel enclosures shall be built to NEC standards for enclosures.

1.2 REFERENCE DOCUMENTS

A. UL 508A – 2001 Standard for Industrial Control Panels`

B. UL 913 -2000 Standard for Safety of Intrinsically Safe Apparatus and Associated Apparatus for use in Class I, II and III, Division 1 Hazardous Locations.

C. NFPA 79 – Electrical Standard for Industrial Machinery

D. NFPA 70 – Article 409

1.3 SUBMITTALS

A. General: Submittals shall be furnished in accordance with MASS Section 10.05 Article 5.6.

B. Control Panel Engineering Submittal: The CONTRACTOR shall submit a control panel engineering submittal (CPES) for each control panel and enclosure provided under Division 40. The CPES shall completely define and document the construction, finish, fuses, circuit breakers, internally-mounted hardware, communications

hardware, and PLC system components. All panel drawings shall, as a minimum, be "B" size with all data sheets and manufacturer specification sheets being "A" size. The submittal shall be in conformance with ISA-S20 – Standard Forms for Process Measurement and Control Instruments, Primary Elements and Control Valves, shall be submitted as a singular complete electronic document, bound volume or multi volume package within 60 calendar days after Notice to Proceed, and shall have the following contents:

1. A complete index shall appear in the front of each bound volume. All drawings and data sheets associated with a panel shall be grouped together with the panels being indexed by systems or process areas. All panel tagging and nameplate nomenclature shall be consistent with the requirements of the Contract Documents.
2. Scale construction drawings which define and quantify the type and gauge of steel to be used for panel fabrication, the ASTM grade to be used for structural shapes and straps, panel door locks and hinge mechanisms, type of bolts and bolt locations for section joining and anchoring, details and proposed locations for "UNISTRUT" members, stiffener materials and locations, electrical terminal box and outlet locations, electrical access locations, print pocket locations, writing board locations, and lifting lug material and locations.
3. Cutout locations with nameplate identifications shall be shown.
4. The Contract Drawing wiring diagrams shall be edited to identify electrical devices, terminals, and interconnecting wiring. These diagrams shall show interconnecting wiring by lines, designate terminal assignments, and show the physical location of all electrical and control devices.
5. Completed ISA S20 data sheets for all instrumentation devices associated with each control panel supplemented with manufacturer specification sheets which verify conformance to the requirements of the Contract Documents.
6. A bill of material which enumerates all devices associated with the control panel.

PART 2 - PRODUCTS

2.1 GENERAL

A. Environmental Suitability: All indoor and outdoor control panels and instrument enclosures shall be suitable for operation in the ambient conditions associated with the locations designated in the Contract Documents. Heating, cooling, and dehumidifying devices shall be provided as shown on the Drawings in order to maintain all instrumentation devices 20 percent within the minimums and maximums of their rated environmental operating ranges. The CONTRACTOR shall provide all power wiring for these devices. Enclosures suitable for the environment shall be provided. All instrumentation in hazardous areas shall be suitable for use in the particular hazardous or classified location in which it is to be installed.

B. Panel construction shall conform to NFPA 70 (NEC) Article 409 and NFPA 79.

C. The control panel controls shall be 24 VDC. Control conductors shall be provided in accordance with the indicated requirements.

D. The control panel shall be the source of power for any 120 VAC solenoid valves interconnected with the control panel. All equipment associated with the control panel shall be ready for service after connection of conductors to equipment, controls, and control panel.

E. Unless indicated otherwise, control panels shall be housed in NEMA-rated enclosures as shown on the Drawings. Control panels shall be either wall-mounted, pedestal-mounted or equipment skid-mounted, as indicated. Internal control components shall be mounted on an internal back-panel or side-panel as required.
   1. All interior control or relay panels mounted above ground level shall be NEMA 12.
   2. All control or relay panels mounted below ground level, unless noted otherwise on the Drawings, shall be NEMA 4X.
   3. All exterior control panels and enclosures mounted above ground level, unless noted otherwise on the Drawings, shall be NEMA 4 with rain shield across top of doors.
   4. All control panels mounted in enclosures meeting the above requirements shall be NEMA 1.

F. Each source of 'external' voltage shall be isolated by providing disconnecting fused terminal blocks or DIN rail mounted relays. Each control panel shall be provided with identified terminal strips for the connection of all external conductors. The CONTRACTOR shall provide sufficient terminal blocks as shown on the Drawings.

G. Motor starters, where required, shall be in accordance with Section 26 24 19 – Low Voltage Motor Control Centers. Each motor starter shall be provided with PLC interface circuits as indicated on the drawings. Electrical components shall be of standard American manufacture.

H. Discrete outputs from the control panels shall be provided by electrically isolated contacts rated for 2 amps at 24 VDC or 5 amps at 120 VAC.

I. All control panel mounted devices shall be provided as shown on the Drawings.

J. Painting: Steel control panels shall be thoroughly cleaned and sand blasted per Steel Structures Painting Council Specification SSPC SP 6 (Commercial Blast) after which surfaces shall receive a prime coat of **Amercoat 185**, or equal, 3 mils DFT, for a total thickness of the prime plus finish system of 6 mils. The finished color of the outside surfaces shall be ANSI 61 gray paint. Interior of the control panel, back-panel, and side-panels shall have a white finish coat.

2.2 CONTROL PANELS

A. NEMA 4X
   1. Enclosure shall be 16-gauge or 14-gauge thickness, unless otherwise indicated on the Drawings, Type 304 or 316L stainless steel.
   2. Enclosures shall have stainless steel hinges, hinge pins, and door clamps.

3. Finish shall be unpainted, smooth #4 brushed finish, as specified for steel control panels.
4. Enclosures and Panels shall be as manufactured by **Hoffman**, or equal.

B. NEMA 12
1. Steel panel section faces shall be No. 14 gauge minimum thickness, unless otherwise indicated on the Drawings. All materials shall be selected for levelness and smoothness.
2. Structural shapes and strap steel shall comply with ASTM A 283 – Low and Intermediate Tensile Strength Carbon Steel Plates, Grade C.
    a. Bolting Material: Commercial quality carbon steel bolts, nuts, and washers shall be 1/2-inch diameter with UNC threads. Carriage bolts shall be used for attaching end plates. All other bolts shall be hex end machine bolts. Nuts shall be hot pressed hex, American Standard, heavy. Standard wrought washers shall be used for foundation bolts and attachments to building structures. All other bolted joints shall have SAE standard lock washers.
3. Construction: Dimensions shall be as shown on the Drawings.
4. Enclosures and Panels shall be as manufactured by **Hoffman**, or equal.

C. Weatherproof NEMA 3R Enclosures: Large, weatherproof enclosures, 4 feet high or higher, shall be built to NEMA 4 standards and shall be rated for outdoor use in wet environments. The enclosures shall be built of 12ga steel to the size shown on the Drawings, and have the following features:
1. Fully gasketed single or double door access as shown on the Drawings, with removable post.
2. Seams continuously welded.
3. Lifting eyes.
4. 3-point latching pad lockable handle on each door.
5. Rollers for the latching rods for 3-point latch.
6. Back panels (full size).
7. Insulation.
8. Open bottom with 2” flange for pad mounting.
9. Provision for mounting fluorescent lights.
10. Enclosures shall be Hoffman, or equal.

D. Fabrication
1. End plates, top plates, and top closure panels (to hung ceiling) shall be provided when required by the material requisition. End plates, top plates, and top closure panels shall be removable with countersunk bolts to match panels. Top closure panels shall be furnished in lengths that match the widths of standard panels, except that one top closure panel may extend across two 4 feet 6 inches wide or five 2 feet wide standard panels. The vertical joints of these panels shall align with the vertical joints of the standard panels.
2. Doors shall be flush-fitting, gasketed, and be of the hinged type with door handles. Screwdriver 1/4 turn or Dzus type fasteners are not acceptable.

a. The flanged edges of all panels shall be straight and smooth. Corners shall be welded and ground smooth.
b. The face of the panel shall be true and level after flanging.
c. All panel cut outs and holes may be cut or drilled by any standard method that does not cause deformation. Burrs shall be ground smooth.
d. Adjacent panels shall assemble with faces flush. Gaps or cracks shall not be visible from the front of the assembled instrument board.
e. Stiffeners shall be welded to the back of panels, as required to prevent panel deformation due to the weight of face-mounted instruments.
f. Panels shall be self-supporting as defined below.

E. Framework and Supports
1. The rear of each panel section shall have a steel framework assembled to it for supporting conduit, wireways, switches, piping, and all instrument accessory items such as relay or terminal enclosures, transducers, pressure switches, valves, and air relays. The main framework shall be constructed of standard structural shapes. Special shapes such as "Unistrut" may be used for secondary supports. Framework must neither interfere with instrument connections nor interfere with access needed for maintenance or adjustments.
2. Steel framework shall extend 2 feet 4 inches back from the panel face, or as indicated in the material requisition. Where indicated, individual adjustable leg supports shall be provided at the back of the framework so that the entire panel is self-supporting.

F. Preparation of Panel Surface
1. The following requirements apply to the front and rear face of the panel, both sides and the edges of all flanges, and the periphery of all holes or cut outs.
a. All high spots, burrs, and rough spots shall be ground smooth.
b. The surfaces shall be sanded or sandblasted to a smooth, clean, bright finish.
c. All traces of oil shall be removed with a solvent.
d. The first coat of primer shall be applied immediately.

G. Instrument Finishing: The final coats applied to painted surface of instrument cases, doors, or bezels that are visible from the front of panels shall be manufacturer's standard, unless otherwise indicated. Black japan or "crinkle" finishes on instrument cases are not acceptable.

H. Mounting of Instruments
1. The panel vendor shall provide cut outs, and shall mount all instrument items indicated to be panel-mounted, including any instruments indicated to be furnished by other vendors but installed in the panel.
2. The panel vendor shall also mount behind the panels other instrument accessory items as required for functionality or as indicated.
3. Equipment mounted at the rear of panel shall be installed to allow for commissioning adjustments, servicing requirements, and cover removal.
4. Spare space shall be kept clear of wiring, etc., to give maximum space for future additions.

I. Electrical Requirements

1. The CONTRACTOR shall provide conduit, wireways, switches, wire, and electrical fittings for all 24 VDC and 120 VAC circuits to instruments and other electrical devices as required for a complete and operable installation.
2. Conduit, wireways, junction boxes and fittings shall include those required between sensors and transmitters and between the junction boxes and instruments.
3. Each terminal connection shall have a plastic plate with a terminal and instrument tag number. Wiring shall be identified with stamped tubular wire end markers. Terminals shall be DIN rail mounted, rated at 400 VAC, manufactured by **Entrelec**, or equal.
4. Each panel shall be provided with a switched LED light fixture, as shown on the Drawings. The fixture shall include a 120-volt receptacle and door switch. The fixture shall be as manufactured by **Hoffman**, or equal.
5. Each panel shall be provided with a switched light fixture, as shown on the Drawings. The fixture shall include a 120-volt receptacle and door switch.
6. Wiring Methods: Wiring methods and materials for all panels shall be in accordance with the N.E.C. requirements for General Purpose (no open wiring) unless otherwise indicated.
7. Signal and Control Circuit Wiring
   a. Wire type and sizes: Conductor shall be flexible stranded copper wire, UL. Wires for instrument signal circuits and alarm input circuits shall be No. 16 AWG Type MTW rated for 300 volts. The analog cables between the PLC I/O card and terminal strips shall be (8) conductor No. 18 AWG cable rated 300 volts for loop powered devices and 8-pair shielded No. 18 AWG cable rated 300 volts for 4-wire loops. DeviceNet cable shall be as per Allen-Bradley requirements, and terminated per Allen-Bradley requirements.
   b. Wire Insulation Colors:
      1) 120 VAC Power - Black 14 AWG minimum
      2) 120 VAC Neutral - White 14 AWG minimum
      3) 120 VAC Ground - Green 14 AWG minimum
      4) 120 VAC Control - Red 14 AWG minimum
      5) 120 VAC Foreign Power - Yellow 16 AWG minimum
      6) 120 VAC Foreign Neutral - Yellow 16 AWG minimum
      7) DC Positive - Blue 16 AWG minimum
      8) DC Negative - White/Blue 16 AWG minimum

      All 120 VAC power wiring protected by the main circuit breaker and incoming power service shall be No. 12 AWG.
   c. Wire Marking: Wire numbers shall be marked using white numbered wire markers made from heat shrink plastic. Wires shall be marked as shown on the Drawings. Numbers shall read from left to right.
   d. Flexible conduit is only to be used where specified.
   e. Conduit fittings shall be **Crouse Hinds cast fittings**, or equal.
   f. For equipment grounding, panels shall be provided with a 1/4 inch by 1 inch copper ground bus complete with solder-less connector for one No. 4 AWG bare stranded copper cable. The copper cable shall be provided by the

CONTRACTOR and be connected to the electrical equipment ground of the 120-volt panel supplying power.

8. Power Supply Wiring
    a. Unless otherwise indicated, all instruments, alarm systems, and motor controls shall operate on 24 VDC circuits.
    b. The panel fabricator shall provide terminal box connections for the main power supply entry as shown on the Drawings.
    c. When instruments do not come equipped with integral fuses, provide fuses as required for the protection of individual instruments against fault currents. Fuses shall be mounted on the back of the panel in a fuse holder, and each fuse shall be identified by a service name tag. Fuses shall be as manufactured by **Bussmann Manufacturing Division, Type KAW TRON**, or equal. Circuit breakers shall be provided as shown on the Drawings.

J. Relays:
1. DIN rail mounted relays shall have contacts rated at 8 amps, 230 volts, at 20,000 operations. The coils shall be 24 VDC at 0.03 amps. Relays shall be **Entrelec model RB121A**, or equal, for single pole, and **RB122** for 5-amp double pole.
2. Battery system test relays shall have contacts rated at 15 amps, 120 VAC, at 150,000 operations. The coils shall be 24 VDC at 0.8 watts. Relays shall be **Siemens 3TX7110-5JC03** with **3TX7144-1E7** socket.
3. Intrinsic Safety Relay: The intrinsic safety relay shall provide isolation of 2-wire 24 VDC circuits in a hazardous location. The safety relays for 4-20 ma analog circuits shall be capable of driving up to a 500-ohm load and pass HART protocol signals to the field devices. The relays shall be **Turk model MK33**, or equal.

K. Terminals: Fused Terminals for analog input and output points shall be a 3-wire terminal with a fused circuit, a feed through circuit and a ground terminal. Fused Terminals for the discrete input points shall be 2-wire terminal with a fused circuit and a feed through circuit. Provide a one-tenth of an ampere rapid blow 250-volt fuse for all analog circuits and all discrete input circuits. The analog terminals shall be **Weidmuller model KDKS 1 part 953245**, and the discrete input terminal shall be **Weidmuller model KDKS 1 PE part 953245**.

L. Spare Fuses: For each panel, provide the following spare fuses:
1. A minimum of two spare fuses of each size
2. One spare fuse for every ten fused circuits

Provide the fuses in a spare fuse box mounted on the interior wall of the panel. Fuse box shall be **Plano Tackle Systems 1061 Accessory Box, Plano, IL**, **www.planomolding.com**, or equal.

M. Power Supply 24 VDC: Each panel shall be supplied from a battery-backed 24 VDC power supply. Each power supply module shall include a DC-OK relay contact that shall be wired to a discrete input card. The power supply shall meet the requirements of Section 26 33 05.

N. The DC power supply shall be a **SENS model Q 024-025-T-L-511-C**, or equal. The batteries shall be 24 V sealed lead acid rated at 103Ah at the 10 hour rate. Batteries are to be (2) units of the **Powersonic Battery model PS-121100**, or equal.

O. DC-DC Converters: Where 0-5 VDC is required a DC to DC converter shall be provided. The converter is to be provided with an overload protection function that protects the load and the power supply from possible damage by over current. When the output current rises above 105% of the rated output current, the protection function is to be triggered decreasing the output voltage. When the output current falls within the rated range, the overload protection function is to be automatically cleared. The DC-DC converter shall be **Omron model S82S-7305**, or equal.

P. 120 VAC Surge Arrestor: A 120 VAC three-stage surge protector shall be provided on the main leads of each panel. The surge protector shall include a first stage inline inductor, a second stage MOV to ground with a thermal fuse, and a third stage array of MOVs to provide a small amount of capacitance. The unit shall be DIN rail-mounted. The MOV shall include green LED to indicate the status of the second stage MOV. Provide two (2) spare units for each panel. The unit shall be rated for 120 VAC and shall be either **Advance Surge Supressor model TSP-WG6-120VAC-10A-01, Control Concepts 'Islatrol Elite' model IE-110**, or equal.

Q. Intrinsic Safety Relay: The intrinsic safety relay shall provide isolation of 2-wire 24 VDC circuits in a hazardous location. The safety relays for 4-20 ma analog circuits shall be capable of driving up to a 500-ohm load and pass HART protocol signals to the field devices. The relays shall be Turk model MK33, or equal.

R. Miscellaneous Parts:
   1. Each panel shall be provided with a large steel folding shelf, 12 inches deep by 18 inches wide, **Hoffman model A-ASHLF1218**, or equal, installed on the panel door as shown on the Drawings..
   2. Each panel shall be provided with a data pocket holder 1 inch deep by 12 inches wide by 12 inches high, **Hoffman model A-DP2**, or equal, installed on the panel door as shown on the Drawings.
   3. Cabinet heater shall be a forced air ventilation enclosed heater with 450-watt wire wound heating element, 120 VAC power cord and cap, creep action thermostat set for 40 degrees F on and 60 degrees F off, enclosed in a metal housing. The unit shall be a UL-listed device suitable for installation in non-UL-listed enclosures. The unit shall be Hi Heat Industries Inc. Model E040100A8, or equal.
   4. Lighting package (LED type) with integral door switch and convenience receptacle. Provide mounting spacers as required.

S. Labor and Workmanship: Panels shall be fabricated, piped, and wired by fully qualified workmen who are properly trained, experienced, and supervised.

2.3 MARKING

A. Control panels shall be marked with the following information that is plainly visible after installation:

1. Manufacturer's name
2. Supply voltage
3. Short-circuit rating of the main breaker
4. Name of the project and site
5. Enclosure rating

PART 3 - EXECUTION

3.1 INSTALLATION

A. Preparation for Shipment and Shipping
   1. Panels shall be crated for shipment using a heavy framework and skids. Panel sections shall be cushioned to protect the finish of the instruments and panel during shipment. Instruments that are shipped with the panel shall further have suitable shipping stops and cushioning material installed to protect parts that could be damaged due to mechanical shock. Each separate panel unit shall be provided with removable lifting lugs to facilitate handling.
   2. All control panel factory testing and inspection shall be performed prior to shipping.
   3. Control panels shall be installed in accordance with Section 40 90 00 – Process Control and Instrumentation Systems.

3.2 PENETRATIONS

A. All penetrations in underground vaults or NEMA 4X areas shall be bottom entry.

3.3 CONTROL PANEL SIGNAL AND CONTROL CIRCUIT WIRING

A. Wiring Installation: All wires shall be run in plastic wireways except (1) field wiring, (2) wiring between mating blocks in adjacent sections, (3) wiring from components on a swing out panel to components on a part of the fixed structure, and (4) wiring to panel mounted components. Wiring run from components on a swing out panel to other components on a fixed panel shall be made up in tied bundles. These bundles shall be tied with nylon wire ties and shall be secured to panels at both sides of the "hinge loop" so that conductors are not strained at the terminals.

B. Wiring run to control devices on the front panels shall be tied together at short intervals with nylon wire ties and be secured to the inside face of the panel using adhesive mounts.

C. Enclosures Wiring: All wiring shall be run in liquidtight flexible conduit (LFMC), unless otherwise noted on the Drawings. All enclosure wiring and raceways shall be installed by the panel builder in the shop.

D. Wiring to rear terminals on panel mount instruments shall be in plastic wireways secured to horizontal brackets above or below the instruments in about the same plane as the rear of the instruments.

E. Shop Drawings shall show conformance to the above wiring installation requirements.

F. Wire Marking: Each network, signal, control, alarm, and indicating circuit conductor connected to a given electrical point shall be designated by a single unique number as shown on the Contract Drawings. These numbers shall be marked on all conductors at every terminal.

3.4 CALIBRATION, TESTING, AND INSTRUCTION

A. General: Calibration, testing, and instruction shall be performed in accordance with Section 40 90 00 – Process Control and Instrumentation Systems.

B. Inspection and Approval
   1. Panel fabricator shall conduct the following tests prior to arrival of the ENGINEER or before shipment, if the ENGINEER chooses not to witness factory testing.
      a. All status, control, analog and alarm circuits rung out to determine their operability.
      b. All electrical power circuits checked for continuity and where applicable, operability.
      c. Any other test required to place the panel in an operating condition.
   2. It shall be the responsibility of the CONTRACTOR to furnish all necessary testing devices and sufficient manpower to perform the tests required by the ENGINEER.
   3. Field Testing: Each control panel shall be tested again for functional operation in the field after the connection of external conductors and prior to equipment startup.

END OF SECTION 40 95 13

SECTION 43 23 00 – DRY LOCATION LIQUID PUMPS

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Replacement of 2 existing pumps and providing new stand and bases for the remaining two existing Wastewater pumps in phased approach, where two existing pumps remain in operation, while the other two are removed and reinstalled or replaced with new wastewater pump; Replacements and reinstallation will include removal and replacement of valves, fittings, pipe and related appurtenances as indicated in the Contract Documents.

B. Furnish, install, and test two new variable speed wastewater pumps with inverter duty, fully enclosed submersible 200 HP motors; and refitting two existing pumps with VFD's, valves, fittings, and related appurtenances, complete and functional with electrical and control systems, as they are staggered into operation from existing to new wastewater pump operation, as specified herein and as shown on the Drawings.

1.2 RELATED SECTIONS

A. Municipality of Anchorage Standard Specifications (MASS), Special Provisions, and Division 1 -General Requirements apply to Work of this Section.

B. 01 11 00 --Work Summary

C. 01 33 00 – Submittal Procedures

D. 01 75 00 – Starting and Adjusting

E. 09 90 00 – Painting and Coating

F. Division 26 – Electrical

G. 40 05 07 – Hangers and Supports For Process Piping

H. 40 05 53 – Process Valves

I. 40 23 40 – Sanitary Wastewater Process Piping

J. 40 90 00 – Process Control and Instrumentation Systems

1.3 QUALITY ASSURANCE

A. Equipment shall, as applicable, meet the requirements of the following industry standards:

1. National Electrical Manufacturer's Association (NEMA) Standards.

2. National Electrical Code (NEC).
3. National Fire Protection Association (NFPA)
4. Underwriters Laboratory (UL and CUL); Factory Mutual (FM).
5. Hydraulic Institute Standards.
6. International Standards Organization (ISO)

1.4 SUBMITTALS

A. Prepare, deliver, and process under provisions of Section 01 33 00, SUBMITTAL PROCEDURES. Requests for proposed substitute or “or-equal” equipment/systems/products will be considered in accordance with the provisions of paragraph “Substitute and “Or-Equal” Products”.

B. Complete list of all deviations from the Drawings and Specifications.

C. Contractor shall submit an anchoring design stamped and signed by a professional engineer registered in the State of Alaska

D. The contractor shall provide Finite Element Analysis of metal base stand, which shows sufficient strength to provide stability and resistance to pump operational and seismic forces and vibration.

E. Shop Drawings. Provide the following:
   1. Certification that field measurements, elevations, and inverts have been verified prior to drawing release.
   2. Proposed methods of temporary shutdown of wastewater pumping, or pipe plugging and/or isolation for pump replacement.
   3. Complete list of deviations from the specifications.
   4. Catalog information including:
      a. Descriptive literature and specifications
      b. Catalog cut sheets
      c. Dimensional drawings, including frame and inlet/outlet configurations
      d. Control drawings and data
      e. Materials of construction
      f. Weights of assembled components, subassemblies
   5. Make, model, motor data, horsepower, rotational speed, suction and discharge size, performance curves showing capacity versus head, net positive suction head required, pump efficiency and power requirements for each equipment assembly.
   6. Provide characteristic curves for variable speed pumps for both actual maximum pump speed and for speeds ranging from 30 hz through 60 hz at 5 hz increments.

7. Manufacturers recommended spare parts and special tools.

8. Special shipping, storage, and protection and handling instructions.

9. Factory finish and coating systems including but not limited to: electric motors, pump, and pump appurtenances.

10. Manufacturer's printed installation instructions for all assemblies and subassemblies including critical dimensions for anchors and fasteners.

11. Maintenance recommendations including:

    a. Maintenance procedures

    b. Frequency of maintenance activities

    c. Lubricants

    d. Other items required at each regular preventative maintenance period.

F. Quality Control Submittals

1. Factory functional and performance test reports. A witnessed Hydraulic Institute Performance Test shall be performed. Pumps shall be tested as specified in Paragraph 3.3. "Manufacturers Services".

2. Operation and Maintenance Manuals, including:

    a. Manufacturers recommended spare parts and special tools.

    b. Recommended operating procedures

    c. Recommended pump maintenance procedures

    d. Pump repair procedures

3. Manufacturer's Certificate of Proper Installation and Operation.

    a. The Manufacturer shall provide written certification to Contractor for submittal to the Owner and Engineer that the equipment has been correctly installed and is operating properly.

    b. The Manufacturer shall submit to Contractor for submittal to the Owner and Engineer, results of testing performed and required by this specification.

4. Manufacturer's Certificate of Training: The Manufacturer will provide a list of signatures of operators who have completed the training requirements of this section.

5. Warrantee Certificate

1.5 MANUFACTURERS' SERVICES

A. A manufacturer's representative for items specified herein shall be present at the job site as each of the new pumps and reinstalled pumps for installation assistance, verification of installation, inspection, functional and performance testing, start-up and

job-site training. This will be a minimum of six trips to the site. Each trip could require two days involvement.

B. Manufacturer's Certificate of Proper Installation and Operation, and Training are required for work under this section for the new pumps.

1.6 DELIVERY, STORAGE AND HANDLING

A. Control components shall be protected from corrosion during shipping and storage. Ship and store equipment with corrosion-inhibitor systems as recommended by the equipment Manufacturer.

B. Store equipment in clean, dry, well-ventilated area. Protect equipment from freezing and provide heated storage areas as recommended by the equipment Manufacturer.

C. Cover equipment, panels and other control elements to protect from dust during construction.

1.7 PHYSICAL CONDITIONS

A. Pre-installation Meeting: Prior to starting work under this section on site, conduct a pre-installation meeting. As a minimum, discuss the work to be performed, the sequence of activities, coordination of work with Owner and Pump Station Operators, and testing and reporting procedures.

PART 2 - PRODUCTS

2.1 GENERAL

A. CONTRACTOR shall be responsible for:

1. Coordination of equipment dimensions, weights and loadings with the above listed Manufacturers and the incorporation of the selected equipment into the dimensional constraints of the site or building, within the limits of the structural and architectural design, piping arrangement and of other equipment features as shown on the Drawings;
2. Electrical work associated with the installation and wiring of controls and monitoring systems.

B. For proposed substitution of "or equal" equipment, CONTRACTOR shall be responsible for:

1. Demonstration to the OWNER/ENGINEER that all requirements of materials, performance, and workmanship have been met or exceeded by the proposed substitution of "or equal" equipment;
2. Modification of appurtenant equipment, piping, supports and bracing to accommodate the proposed substitution of "or equal" equipment. CONTRACTOR shall notify OWNER/ENGINEER of modifications necessary to accommodate the

proposed substitution of “or equal” equipment, and shall submit for review and approval the proposed modifications.

3. All costs associated with system evaluation and redesign including all architectural, structural, electrical, mechanical and civil aspects of the installation modification to accommodate the proposed substitution of “or equal” equipment.

C. The Contract Documents indicate specific required features of the equipment, but do not purport to cover all details of design and construction.

2.2 ELECTRICAL

A. All work shall be configured and assembled in accordance with applicable electrical Codes and Standards observed in the United States and Alaska. References to applicable Codes and Standards are included in Division 26 Specifications.

B. All equipment, systems, assemblies, controls and instrumentation, electrical drivers, and appurtenant electrical components shall be third party listed and labeled per the regulations of the State of Alaska. Third party listings include Underwriters Laboratories, Factory Mutual, and others suitable to the State of Alaska Mechanical Inspections Division. Use listed materials in the work according to the criteria for these listings.

C. Manufacturer shall verify equipment to be shipped to job site conforms to NEC/NFPA requirements and meets the State of Alaska third party listing and labeling. Equipment not meeting the requirements of these specifications shall be replaced with compliant equipment or be certified by a third party inspector at the Manufacturer’s expense.

2.3 WASTEWATER PUMPS

A. Equipment Tag Numbers

1. P-1 (Pump 1 - new)
2. P-2 (Pump 2 – existing to remain)
3. P-3 (Pump 3 - existing to remain)
4. P-4 (Pump 4 - new)

B. Description:

1. Furnish two (2) Premium Efficiency, non-clog, Submersible Sewage Pump(s) for dry pit application. Type (Sulzer) ABS XFP 250J-CB2 or approved equal. The intent is to match the two identical pumps that are currently in service. The pumps shall be designed for continuous operation and constructed to meet the intended service. The pumps shall be designed to operate both individually and in parallel with up to three pumps total. The pumps shall be supplied with mating 10 inch flanged intake and discharge connections and be capable of delivering 5100 U.S. GPM at a total dynamic head of 83 feet. The motor shall be an integral part of the pump unit. The motor shall be 168 HP, premium efficiency motor connected for operation on a 480 volt, 3 phase, 60 hertz electrical supply service.

Motors shall have a closed loop cooling system. No circulating product water cooling.

2. Country of origin – Neither the pump assembly or any major component shall be manufactured in the People's Republic of China.

3. Pumps shall be supplied with steel mounting frames. Two additional identical pump bases shall be provided to replace the bases on the existing ABS XFP 250J-CB2 pumps.

4. The heavy duty submersible wastewater pump(s) shall be capable of handling raw unscreened sewage, storm water, and other similar solids-laden fluids without clogging.

C. Primary Operating Requirements (Single Pump Operation):

- Capacity —5100 gpm @ Head 83 ft, 1787 rpm
- Hydraulic Efficiency – 77% minimum
- Vibration—Vibration at operating speeds above 67% rated speed, measured on non-rotating parts at the motor top level shall not exceed 0.3 in/sec.

D. Secondary Operating Requirements (Parallel Pump Operation):

- Capacity —4600 gpm @ Head 91 ft, 1787 rpm (Two Pumps)
- Capacity —4100 gpm @ Head 101 ft, 1787 rpm (Three Pumps)
- Variable Speed, 900 – 1787 rpm

E. Impeller: The impeller shall be the Sulzer Contrablock impeller or approved equal. The impeller shall be of gray cast iron, EN-GJL-250 (ASTM A-48, Class 35B), The impeller shall be of the semi-open, non-clogging, two-vane design, meeting the Ten State Standards requirement for minimum solids passage size of 3 inches. The impeller shall be dynamically balanced to the ISO 10816 standard to provide smooth, vibration-free operation

F. Self-Cleaning Wear Plate: The wear plate shall be of gray cast iron, EN-GJL-250 (ASTM A-48, Class 35B). The wear plate shall be designed with an inlet incorporating strategically placed cutting grooves as well as an outward spiral V-shaped groove on the side facing the impeller. The dual groove system shall be used to shred and force stringy solids outward from the impeller and through the pump discharge. The wear plate shall be mounted to the volute with four stainless steel securing screws and four stainless steel adjusting screws to permit close tolerance adjustment between the wear plate and impeller for maximum pump efficiency. Adjustment to allow for wear and restore peak pumping performance shall then be accomplished using standard tools, and without requiring disassembly of the pump. The suction flange shall be integrated into the wear plate and its bolt holes shall be drilled and tapped to accept standard 10 inch ANSI class 125/150 flanged fittings.

G. Pump Volute: The pump volute shall be a single-piece, gray cast iron, EN-GJL-250 (ASTM A-48, Class 35B), non-concentric design with centerline discharge. Passages shall be smooth and large enough to pass any solids which may enter through the impeller. The discharge size shall be 10 inches. The discharge flange design shall permit attachment to standard ANSI and DIN flanges/appurtenances. The discharge

flange shall be drilled to accept either 10 inch ANSI class 125/150 flanged fittings. The minimum working pressure of the volute and pump assembly shall be 10 bar (145 psi)

H. Motor: The Premium Efficiency motor shall meet efficiency standards in accordance with IEC 60034-30:2008, level IE3 and NEMA Premium. Motor rating tests shall be conducted in accordance with IEC 60034-2-1 requirements and shall be certified accurate and correct by a third party certifying agency. A certificate shall be available upon request. The motor shall be housed in a water-tight gray cast iron, EN-GJL-250 (ASTM A-48, Class 35B), enclosure, capable of continuous submerged operation underwater to a depth of 20 meters (65 feet) and shall have an IP68 protection rating. The motor shall be of the squirrel-cage induction design, NEMA type B. The copper stator windings shall be insulated with moisture resistant, Class H insulation material, rated for 180°C (356°F). The stator shall be press fitted into the stator housing. The use of bolts, pins, or other fastening devices requiring penetration of the stator housing is unacceptable. The rotor bars and short circuit rings shall be made of cast aluminum. The motor shall be designed for continuous duty. The maximum continuous temperature of the pumped liquid shall be 40°C (104°F), and intermittently up to 50°C (122°F). The motor shall be capable of handling up to 10 evenly spaced starts per hour without overheating. The service factor (as defined by the NEMA MG1 standard) shall be 1.3. The motor shall have a voltage tolerance of +/- 10% from nominal, and a phase-to-phase voltage imbalance tolerance of 1%. The motor shall have a NEMA Class A temperature rise, providing cool operation under all operating conditions. The motor shall be FM approved for use in NEC Class I, Division I, Groups C & D hazardous locations. The surface temperature rating shall be T3C. The motor shall meet the requirements of NEMA MG1 Part 30 and 31 for operation on PWM type Variable Frequency Drives.

I. Cooling System: The factory installed closed-loop cooling system shall be of steel, 1.0036 (ASTM A-570, Grade D), adequately designed to allow the motor to run continuously under full load while in an unsubmerged (dry-pit) or minimally submerged condition without the need for de-rating or reduced duty cycle. A cooling jacket shall surround the stator housing, and an environmentally safe nontoxic propylene glycol solution shall be circulated through the jacket by an axial flow circulating impeller attached to the main motor shaft. The coolant shall be pumped through an integrated heat exchanger in the base of the motor whenever the motor is running, allowing excess heat to be transferred to the process liquid. Cooling systems that circulate the pumped medium through the cooling jacket, or those that use a toxic cooling liquid shall not be acceptable. The use of external heat exchangers, fans, or the supply of supplemental cooling liquid shall not be required.

J. Thermal Protection: Each phase of the motor shall contain a normally closed bi-metallic temperature monitor switch imbedded in the motor windings. These thermal switches shall be connected in series and set to open at 140°C +/- 5°C (284°F). They shall be connected to the control panel to provide a high stator temperature shutdown signal, and are used in conjunction with external motor overload protection. Three RTD (PT100) type temperature measuring devices shall also be supplied for the motor, one for the winding and one for each bearing to provide actual temperature measurement at these locations. The bi-metallic system must be connected to the control to provide positive shutdown of the motor in the event of an overheat condition. This is required in order to conform to FM rules for explosion-proof equipment.

K. Mechanical Seals: Each pump shall be equipped with a triple seal system consisting of tandem mechanical shaft seals, plus a radial lip seal; providing three complete levels of

sealing between the pump wet end and the motor. The mechanical seal system shall consist of two totally independent seal assemblies operating in a lubricant reservoir that hydro-dynamically lubricates the lapped seal faces at a constant rate. The mechanical seals shall be of nonproprietary design, and shall be manufactured by a major independent manufacturer specializing in the design and manufacture of mechanical seals. The lower, primary seal unit, located between the pump and the lubricant chamber, shall contain one stationary industrial duty solid silicon-carbide seal ring and one rotating industrial duty solid silicon-carbide seal ring. The stationary ring of the primary seal shall be installed in a seal holding plate of gray cast iron EN-GJL-250 (ASTM A-48, Class 35B). The seal holding plate shall be equipped with swirl disruption ribs to prevent abrasive material from prematurely wearing the seal plate. The upper, secondary seal unit, located between the lubricant chamber and the sensing chamber, shall contain one stationary industrial duty solid silicon-carbide seal ring, and one rotating industrial duty solid silicon-carbide seal ring. Each seal interface shall be held in contact by its own spring system. A radial lip seal shall be positioned above the sensing chamber, preventing any liquid which accumulates in the sensing chamber from entering the lower bearing and motor. The seals shall not require routine maintenance, or adjustment, and shall not be dependent on the direction of rotation for proper sealing. Each pump shall be provided with a lubricant chamber for the shaft sealing system which shall provide superior heat transfer and maximum seal cooling. The lubricant chamber shall be designed to prevent overfilling, and to provide lubricant expansion capacity. The drain and inspection plug shall have a positive anti-leak seal, and shall be easily accessible from the outside of the pump. The seal system shall not rely upon the pumped media for lubrication and shall not be damaged when the pump is run dry. Lubricant in the chamber shall be environmentally safe nontoxic material.

L. Mechanical Seal Protection System: The primary mechanical seal shall be protected from interference by particles in the wastewater, including fibrous materials, by an active Seal Protection System integrated into the impeller. The back side of the impeller shall be equipped with a sinusoidal cutting ring, forming a close clearance cutting system with the lower submersible motor housing or seal plate. This sinusoidal cutting ring shall spin with the pump impeller providing a minimum of 75 shearing actions per pump revolution. Large particles or fibrous material which attempt to lodge behind the impeller or wrap around the mechanical seal, shall be effectively sheared by the active cutting system into particles small enough to prevent interference with the mechanical seal. The Seal Protection System shall operate whenever the pump operates, and shall not require adjustment or maintenance in order to function.

M. Seal Failure Early Warning System: The integrity of the mechanical seal system shall be continuously monitored during pump operation and standby time. An electrical probe shall be provided in a sensing chamber positioned above the mechanical seals for detecting the presence of water contamination within the chamber. The sensing chamber shall be oil-filled and shall have a drain / inspection plug with a positive anti-leak seal which is easily accessible from the outside of the pump. A solid-state relay mounted in the pump control panel or in a separate enclosure shall send a low voltage, low amperage signal to the probe, continuously monitoring the conductivity of the liquid in the sensing chamber. If sufficient water enters the sensing chamber, the probe shall sense the increase in conductivity and signal the solid state relay in the control panel. The relay shall then energize a warning light on the control panel and cause the pump to shut down. One additional moisture sensing probe in the motor chamber shall be provided. These probes shall send separate signals to the control panel as described

above, so that maintenance personnel are given an early warning of the presence of moisture in the respective sensing chambers.

N. Shaft: The pump shaft and motor shaft shall be an integral, one piece unit adequately designed to meet the maximum torque required at any normal start-up condition or operating point in the system. The shaft shall have a full shutoff head design safety factor of 1.7, and the maximum shaft deflection shall not exceed .05 mm (.002 inch) at the lower seal during normal pump operation. Each shaft shall be of stainless steel, 1.4021 (AISI 420), with the option of upgrading to duplex stainless steel, 1.4462 (UNS S31803), and shall have a polished finish with accurately machined shoulders to accommodate bearings, seals and impeller.

O. Bearings: Each pump shaft shall rotate on high quality, permanently lubricated, greased bearings. The upper bearing shall be a cylindrical roller bearing. The upper bearing be electrically isolated from the bearing housing to prevent bearing damage from circulating currents when the pump is operated on a variable frequency drive. The lower bearings shall be a matched set of at least three heavy duty bearings; two angular contact ball bearings and one cylindrical roller bearing. All three lower bearings shall have identical outer race diameters to provide maximum bearing load capacity. Designs which utilize a roller bearing with a smaller outer diameter than the other bearings in the assembly do not provide maximum load capacity and shall not be considered equal. Bearings shall be of sufficient size and properly spaced to transfer all radial and axial loads to the pump housing and minimize shaft deflection. L-10 bearing life shall be a minimum of 100,000 hours at flows ranging from ½ of BEP flow to 1½ times BEP flow (BEP is best efficiency point). The bearings shall be manufactured by a major internationally known manufacturer of high quality bearings, and shall be stamped with the manufacturer's name and size designation on the race.

P. Power Cable: The power cables shall be sized according to NEC and CSA standards, as called for on the Plans, and shall be of sufficient length to reach the motor control center without requiring splices. The outer jacket of the cable shall be of chlorinated polyethylene (CPE) and be oil, water, and UV resistant, capable of continuous submerged operation underwater to a depth of 65 feet.

Q. Cable Entry/Junction Chamber: The cable entry design shall not require a specific torque to insure a watertight seal. The cable entry shall consist of cylindrical elastomer grommets, flanked by stainless steel washers. A cable cap incorporating a strain relief and bend radius limiter shall mount to the cable entry boss, compressing the grommet ID to the cable while the grommet OD seals against the bore of the cable entry. The junction chamber shall be isolated and sealed from the motor by means of sealing glands. Electrical connections between the power cables and motor leads shall be made via a compression or post type terminal board, allowing for easy disconnection and maintenance.

R. Base Assembly (vertical dry-pit installation): For the dry-pit installation, the pump shall be secured to a steel support stand attached to cast concrete support pillars (concrete support pillars supplied by others) of suitable strength to support the weight of the pump and resist any expected torsion, bending, Seismic (1g) and vibration forces. The pump manufacturer shall provide a Finite Element Analysis that shows the adequacy to support the pump and minimize vibration and movement. Two additional base assemblies shall be provided to replace the base assemblies on the existing ABS XFP 250J-CB2 pumps.

S. Vibration—Vibration at operating speeds above 67% rated speed, measured on non-rotating parts at the motor top level shall not exceed 0.3 in/sec.

1. Vibration sensors shall be a vibrational velocity transducer and shall provide a 4-20mA signal for direct connection to the station SCADA control panel without the need for additional interfacing, converting, or differentiating equipment. Sensors shall be rigidly fastened to pumps; magnetic or epoxy mounting will not be accepted.
2. Vibration sensors for new pumps Pump 1 and Pump 4 shall be an optional protection item from the pump manufacturer and shall be factory installed in a pump junction chamber.
3. Vibration sensors for existing pumps Pump 2 and Pump 3 shall be field installed as direct replacement of existing vibration sensors. The intent is for all four sewage lift pumps to utilize identical vibration sensors for maintenance purposes.
4. Mount new vibration sensors on existing pumps Pump 2 and Pump 3. Drill and tap the motor cap and mount the sensors directly to the motor bearing cap at the top of the motor. Mounting shall be approved by the pump manufacturer and be comparable to the sensor mounting and placement in the new pumps. Touch-up paint as required.
5. Vibrations sensors shall meet the following requirements:
    a. UL Listed
    b. 4-20mA output at 0-10mm/s, 0-20mm/s, 0-25mm/s, 0-50mm/s, 0-100mm/s
    c. 2Hz – 1kHz frequency range
    d. 24Vdc power supply
    e. IP67 rating
    f. stainless steel construction
    g. factory supplied PTFE, stainless steel armored cable

T. Vibration sensors shall be as recommended by the pump manufacturer.

2.4 FACTORY FINISHING

A. Prior to shop coating, all surfaces of the pumps, motors, and accessories shall be thoroughly clean, dry, and free from all mill-scale, rust, grease, dirt, paint and other foreign matter

B. All ferrous surfaces sandblasted according to NACE SP6 Commercial cleaning.

C. Each pump and motor exterior shall be shop coated with a two part epoxy as manufactured by Tnemec or equal.

D. All gears, bearing surfaces and other surfaces obviously not to be painted shall be given a heavy coat of grease or other suitable rust resistant coating, unless otherwise specified herein. This coating shall be maintained, as required, to prevent corrosion during periods of storage and installation.

E. Motor shall be coated with manufacturers corrosion resistant coating.

2.5 ACCESSORIES

A. Equipment Identification Plates:

1. The Contractor shall identify each unit of equipment with a corrosion resistant nameplate, securely affixed in a conspicuous place. Nameplate information shall include equipment model number, serial number, electrical specifications, equipment capacity, supplier's name and location.

2. 16-gauge stainless steel identification plate shall be securely mounted on the equipment in a readily visible location. The plate shall bear the ¼-inch die-stamped equipment name and identification number indicated in this specification.

B. Anchor Bolts:

1. Provide six 7/8-inch anchor bolts, reference structural plans.

2. Equipment shall be placed on the foundations, leveled, shimmed, bolted down, and grouted with a non-shrinking grout. Reference structural plans.

2.6 LUBRICANTS

A. Contractor shall furnish all lubricants required for startup, initial operation, and testing of the equipment as recommended by the Manufacturer.

2.7 SPARE PARTS AND SPECIAL TOOLS

A. Manufacturer shall provide one set of recommended spare parts for each pump provided.

B. Spare parts shall be packaged in containers suitable for shipping and long-term storage and shall include complete installation instructions and shall bear labels clearly designating the contents and the equipment for which they are intended.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that dimensions are correct and project conditions are suitable for installation. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Contractor shall verify equipment provided to the job site conforms to NEC/NFPA requirements and meets the State of Alaska third party listing and labeling requirements.

C. The Contractor shall touch-up all shipping and construction damage to factory coatings.

3.2 INSTALLATION

A. Install in accordance with the Manufacturer's printed instructions.

B. Anchor Bolts: Accurately place using equipment templates.

C. Support and securely anchor equipment and appurtenances. Process connections shall be plumb and tight.

D. Contractor shall rely on Manufacturer for installation and startup assistance.

E. Contractor shall coordinate scheduling of Manufacturer trip to the jobsite in Anchorage, Alaska with the Engineer, Owner and the Manufacturer.

3.3 MANUFACTURER'S SERVICES

A. The manufacturer shall conduct performance tests on each pump in accordance with Hydraulic Institute ISO 2548 Annex B, Hi Level 2B criteria (Flow =/- 8%, Head +/- 5%, Power +8%, Eff -5%). as follows:

1. The factory tests shall be a minimum of 6 hours continuous on each pump including a minimum of 4 hours at full speed and a minimum of 0.5 hours at each of the 4 reduced speed operating points: 60% rated speed (36 hz), 70% rated speed (42 hz), 80 % rated speed (48 hz), and 90% rated speed (54 hz).
2. The pumps shall be tested with the same motor that will be installed on the pump at PS 12.
3. For each of the pump speeds listed, gather data at the design point as well as at least 2 other points to develop a set of performance curves. Data shall be collected to plot the head-capacity curve in addition to the efficiency and brake horsepower.
4. Conduct vibration analysis at each of the pump speeds listed. Prior to vibration analysis, identify resonant frequencies (see Section 26 29 23 – Variable Frequency Drive Units).
5. Conduct static pressure test of mechanical seal at 100% rated speed, 1787 RPM.
6. Verify correct operation of alarm functions.
7. Alignment: Test complete assemblies for correct rotation, proper alignment and connection, quiet operation, and no vibration.
8. Operating Temperatures: Monitor bearing areas on pump and motor for abnormally high temperatures.
9. Provide a certified pump test report.

10. The factory pump test shall be observed by representatives of the Owner. Both pumps shall be tested consecutively. The pump tests shall be scheduled, and the Owner notified, no less than 4 weeks in advance. Contractor shall provide airfare, lodging, transportation, and meals for two Owner representatives.

B. A manufacturer's trained specialist, experienced in the installation of the specified pump, and with at least five (5) years of field experience shall be present at the job site and/or classroom designated by the Owner for the number of days specified to provide the following services:

1. Installation Inspection: Prior to system start up, the Manufacturer shall inspect the installation of the equipment including instrumentation and control and power wiring to verify system installation is satisfactory for operation.

2. Start-Up Services: The Manufacturer shall provide a technical representative to the project site to observe the start-up of the equipment, adjust the equipment, and troubleshoot problems with the equipment as needed.

   a. Individual Pump Test – During start-up services, each new pump will be required to operate at full speed pumping the raw wastewater at PS12 for a cumulative total of 4-hours of run time at the specified head and discharge for single pump operation (i.e. 5100 gpm at 83 ft of head). For each pump this 4 hours will consist of consecutive start and stop operations with run times varying from 10 to 40 minutes. The duration of each individual pump test is anticipated to span 14 hours.

   b. Parallel Pump Test Two Pumps – Following the satisfactory individual pump tests, two separate onsite pump performance tests shall be conducted. The parallel pump tests will use the raw wastewater at PS 12. The durations of each of the tests will be 15 minutes:

      1) Two new pumps in parallel

      2) Two new pumps and one existing pump (three pumps total in parallel)

3. Operator Training: The Manufacturer representative shall provide a minimum of 4 hours of training at the project site to review the Operations and Maintenance (O&M) Manuals for the project with the operations personnel.

   a. O&M Manuals used for the training must have prior approval by the Engineer through the submittal process prior to use in the training.

   b. Manufacturer to provide Owner signatures of operators attending the training certifying they have completed the training provided for the project.

C. Contractor shall notify the Owner, Engineer, and Manufacturer in writing, 14-days prior to the date when the installation will be ready for inspection.

3.4 FIELD QUALITY CONTROL

A. Test electrical, process instrument and control system elements per the requirements of Division 26 and Division 40 Specifications.

B. Functional and Performance Testing:

1. Conduct on all pumps furnished and installed. Test at each of the speeds listed in Paragraph 2.3, C. “Operating Conditions”. This will necessitate running the tests at different times at different stages of construction.
2. Perform under actual or approved simulated pump operating conditions.
3. After establishing satisfactory pump operation, fill wetwell to the high water alarm elevation and run to pump off elevation. Test for three cycles without malfunction.
4. Verify correct operation of all control and alarm functions.
5. Alignment: Test complete assemblies for correct rotation, proper alignment and connection, quiet operation, and no vibration.
6. Operating Temperatures: Monitor bearing areas on pump and motor for abnormally high temperatures.
7. Test Log: Record the following:
    a. Total head
    b. Capacity. Use wet well drawdown rates to compute pump capacity. Verify with existing flow meters.
    c. Horsepower requirements
    d. Insulation resistance measured on the stator and power cables.
    e. Drive motor operating voltage and amperage measured for each phase under peak load/pump output operating conditions and no load.

3.5 RECORD DRAWINGS

A. Contractor shall maintain a current set of construction drawings and specifications that reflect any changes, modifications, clarifications, additions or deletions from the original scope of work. Annotations shall include any Contractor issued equipment or wiring identification tags and/or numbers. Record drawing information shall be provided to the Owner at the completion of system start up and substantial completion.

3.6 TROUBLESHOOTING SERVICES

A. If equipment and system do not meet manufacturer’s published performance ratings or the performance requirements of this specification, Contractor and Manufacturer’s Representative shall provide troubleshooting services to identify the cause of the problem.

B. If performance problems are due to defects in the work installed by the Contractor, Contractor shall correct the defective work at no cost to the Owner. If performance problems are due to defects in manufacturer’s materials or workmanship defects in the equipment, Contractor shall, with the assistance of the Manufacturer’s Representative for that equipment, identify the fault and recommend repair and/or replacement of the faulty component or components to the Owner at no cost to the Owner.

3.7 FIELD FINISHING AND TOUCHUP

A. Provide field finishing and equipment touchup as recommended by the manufacturer.

3.8 FINAL CLEANING

A. Clean surfaces in accordance with manufacturer's printed instructions.

END OF SECTION

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 SEWER IMPROVEMENTS

PUMP STATION 12 FORCE MAIN / INTERCEPTOR C GRAVITY JUNCTION REHABILITATION

SECTION IV

SUBMITTAL LIST AND STANDARD FORMS

Submittal List

Submittal Transmittal

Certificate of Compliance

ADEC Certificate of Construction

ADEC Municipal Grants & Loans American Iron and Steel

Requirements Sample Forms

Design Clarification & Verification Request

Deviation Request

Substitution Request

Subcontractor & Supplier List

Equipment Data Forms

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 SEWER IMPROVEMENTS

PUMP STATION 12 FORCE MAIN / INTERCEPTOR C GRAVITY JUNCTION REHABILITATION

Job WW.H7713 Contractor: _____

Submittal No.	Description	Submittal Schedule
10.03.2	Bid Submittals	Prior to the time of opening specified in the Invitation to Bid and the exact date and time of receipt of Bids shall be recorded.
10.04.9	Waste disposal on private property	Prior to construction.
10.04.13	Traffic Control Plan (TCP)	Within ten (10) days of NTP, or five (5) days before commencement of work, whichever is earlier.
10.04.15	Storm Water Pollution Prevention Plan (SWPPP)	No less than twelve (12) days prior to the beginning of excavation or within ten (10) days of NTP, whichever comes first.
10.04.19	Record Documents	Within thirty (30) days after Substantial Completion or prior to Final Acceptance of the project, whichever is earlier.
10.04.22	24-Hour Emergency Contact Number*	Prior to commencement of work * Found in Construction Specifications
10.05.3	Construction Progress Schedule/Schedule of Values	Within ten (10) days of the effective Notice to Proceed, and prior to the commencement of Work.
10.05.3	Critical Path Method (CPM) Schedule	No later than twenty-one (21) days from the effective date of the Notice to Proceed and at least monthly thereafter.
10.05.4	Unusual Working Hours	At least forty-eight (48) hours advance notice.

10.05.5	Shop Drawings	Within reason and in such sequence as to cause no delay in the Work or in the work of the Owner or any other contractor.
10.05.6	Product Data	Within reason and in such sequence as to cause no delay in the Work or in the work of the Owner or any other contractor.
10.05.7	Materials Substitutions	Within ten (10) calendar days of the effective date of the Notice-to-Proceed (or such time as may be approved in writing by the Engineer.)
10.05.10	Subcontractor List	Within ten (10) days after the effective date of the Notice-To-Proceed, and prior to the commencement of the Work.
10.05.18	Changed Conditions	No later than two (2) working days, and before such conditions are disturbed.
10.05.20	Change Order Proposal	Prior to payment of changed Work
10.05.21	Claims for Additional Compensation	Initial Notification - Immediately.
10.05.26	Pre-Final Inspection Notification	After completion of Work After code compliance inspections
10.05.29	Termination of Work for Owners Convenience	Immediately after receiving a Notice of Termination.
10.05.34	Work Plan	Prior to beginning construction.
10.06.9	Insurance	Prior to execution of the Contract.
10.07.4	Change Order Proposal/ Negotiated Changes	Prior to payment of the changed Work.
10.07.5	Application for Partial Payment	

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10.07.7	Final Payment	Upon completion of the Work and issuance of a certificate of completion by the Engineer, and prior to acceptance of the work.
20.02.3.A	Hazardous Material Control Plan (HMCP), Spill Prevention, Control, and Countermeasure Plan (SPCC)	Seven (7) days prior to commencement of excavation work
20.02.3.B	Storm Water Pollution Prevention Plans (SWPPP)	No less than twelve (10) days prior to the beginning of excavation or within 10 days of NTP, whichever comes first.
20.12.3	Construction Dewatering Plan	No less than seven (7) days prior to the beginning of dewatering activities.
20.30.3	Excavation, Shoring, and Temporary Material Storage Plan	Submitted three (3) days prior to the beginning of work involving shoring. Submitted ten (10) days prior to construction or within 10 days of NTP, whichever comes first.
20.31.2	Staging Area Survey	Within reason and in such sequence as to cause no delay in the Work or in the work of the Owner or any other contractor.
30.01.7	Ready-Mixed Concrete	Prior to unloading the concrete mix at the construction site.
40.06.2.A	Asphalt Concrete Pavement	Prior to paving.
40.07.3.E	Job-Mix	Fifteen (15) days prior to paving.
40.07.5	Paving Plan	Minimum of five (5) days prior to commencement of paving.
50.05	Sewer Flow Control Plan	Not less than one (1) month prior to bypass

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50.07.4	CCTV Inspection Files	Within five (5) days of completing inspection
50.09.5B	Work Plan for Installing HDPE Pipe in Place	Minimum of sixty (60) calendar days prior to the start of sliplining work
50.09.5K	Interim Pressure Test Results	Upon completion of each test
50.09.5M	Safety Plan	Prior to construction
50.10.2A	Grout Mix and Placement Plan	Minimum of four (4) weeks prior to commencing grouting operations
50.10.3	Grouting Supervisor Qualifications	Prior to construction
50.10.5B	Grout Field Quality Control	Upon placement of each batch
~~50.12~~	~~Creek Crossing Work Plan~~	~~Minimum of sixty (60) calendar days prior to the start of crossing work~~
60.08	Groundwater Well Abandonment Log	Prior to final payment
65.02.14	As-built Surveys and Record Drawings	Upon completion of construction activity.
70.12.1	Traffic Control Plan (TCP)	Prior to commencement of the project.
75.03.2	Soil Analysis Test Reports	Ten (10) days prior to final placement
75.04.2	Seed Certification	Ten (10) days prior to application.
75.12.1	Soil Stabilization Method and Materials	Prior to beginning work.
05 50 00	Shop Drawings for Metal Fabrications	Prior to construction
09 90 00	Painting and Coating Product Data	Thirty (30) days prior to start of painting
26 05 00	Electrical Work, General – Shop Drawings, Materials and Equipment Schedule, O&M Manuals, Record Drawings, Equipment Summary Sheets	Within thirty (30) days of Notice to Proceed

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Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 SEWER IMPROVEMENTS

PUMP STATION 12 FORCE MAIN / INTERCEPTOR C GRAVITY JUNCTION REHABILITATION

26 05 00	Electrical Work, General – Work Plan with anticipated outages	Thirty (30) days prior to beginning work
26 24 19	Low Voltage Motor Control Centers - Anchoring Design	Within thirty (30) days of Notice to Proceed
40 05 53	Process Valves – Substitute or “Or-equal” request, complete list of deviations, shop drawings and product information, quality control information	Within thirty (30) days of Notice to Proceed
40 05 60	Shop Drawings for Sluice Gates	Prior to construction
40 05 65	Shop Drawings for Sluice Gates Actuators	Prior to construction
40 23 40	Sanitary Wastewater Process Piping - Substitute or “Or-equal” request, complete list of deviations, shop drawings and product information, quality control information	Within thirty (30) days of Notice to Proceed
43 23 00	Dry Location Liquid Pumps - Substitute or “Or-equal” request, complete list of deviations, shop drawings, and product information, quality control information	Within thirty (30) days of Notice to Proceed
43 23 00	Dry Location Liquid Pumps - Anchoring Design and Base Stand Design	Within thirty (30) days of Notice to Proceed

NOTE: The above list of submittals is not all-inclusive. In addition to the above, the Contractor is required to comply with all submittal requirements as required or identified in the plans, Special Provisions, MASS, or as directed by the Engineer. (See Division 10, Section 10.04, Article 4.3.)

SUBMITTAL TRANSMITTAL

PROJECT: Pump Station 12 SUBMITTAL NO.: _____

CONTRACTOR: _____ CONTRACT NO.: _____

ORIGINATOR: _____ SPEC. SECTION: _____

DATE SUBMITTED: _____ DRAWING NO.: _____ SHEET _____ OF _____

TO: ANCHORAGE WATER & WASTEWATER UTILITY
Engineering Division
3000 Arctic Boulevard

ATTN: _____

ITEM: _____

SUPPLIER/CONTRACTOR:

☐ Original Submittal ☐ 3rd

☐ 2nd ☐ 4th

		REVIEW ACTION						
		COPIES SENT	NO EXCEPTION TAKEN	MAKE CORRECTIONS AS NOTED	AMEND AND RESUBMIT	REJECTED RESUBMIT	COPIES RETURNED	NOTES ATTACHED
ID. NO.	DETAILED DESCRIPTION (Provide Itemized List of Contents of this Submittal)		A	B	C	D		

Complete either (a) or (b), following:

☐ (a) We have verified that the material or equipment contained in this submittal meets all the requirements specified or shown (no exceptions).

☐ (b) We have verified that the material or equipment contained in this submittal meets all the requirements specified or shown, except for the following deviations (list deviations, attach a separate sheet if necessary).

Corrections or comments made relative to submittals during this review do not relieve the Contractor from compliance with the requirements of the drawings and specifications. This submittal is only for review of general conformance with the design concept of the project and general compliance with the information given in the contract documents. The Contractor is responsible for confirming and correlating all quantities and dimensions; selecting fabrication processes and techniques of construction; coordinating his work with that of other trades, and performing his work in a safe and satisfactory manner.

CONTRACTOR: _____ ENGINEER: _____
(Signature) (Signature)

ROUTING	RECEIVED BY NAME / COMPANY	DATE RECEIVED	DATE FORWARDED	COMMENTS
Project Manager				
Designer				
Project Manager				
Contractor				

AWWU SUBMITTAL REVIEW ACTION

PROJECT Pump Station 12 SUBMITTAL NO. _____

CONTRACTOR _____ CONTRACT NO. _____

ORIGINATOR _____ SPEC. SECTION _____

DATE SUBMITTED _____ DRAWING NO. _____ SHEET _____ OF _____

A-NO EXCEPTION TAKEN
B-MAKE CORRECTIONS AS NOTED
C-AMEND AND RESUBMIT
D-REJECTED RESUBMIT

REVIEW ACTION	ID. NO.	COMMENT:

ENGINEER: _____ DATE: _____

CERTIFICATE OF COMPLIANCE

Project Name: **Pump Station 12** Contract No. C-_____

I (WE) CERTIFY THAT ALL WORK HAS BEEN PERFORMED AND MATERIALS SUPPLIED IN ACCORDANCE WITH THE PLANS, SPECIFICATIONS AND CONTRACT DOCUMENTS FOR THE ABOVE WORK, AND THAT:

A. Not less that the prevailing rates of wages as ascertained by the governing body of the contracting agency has been paid to laborers, workmen, and mechanics employed on this work;

B. There have been no unauthorized substitutions of subcontractors; nor have any subcontracts been entered into without the names of the subcontractors having been submitted to the Engineer prior to the start of such subcontracted work;

C. No subcontract was assigned or transferred or performed by any subcontractor other than the original subcontractor, without prior notice having been submitted to the Engineer together with the names of all subcontractors;

D. All claims for material and labor and other services performed in connection with these specifications have been paid;

E. All monies due the State Industrial Accident Fund, the State Unemployment Compensation Trust Fund, the State Tax Commission, hospital associations and/or other have been paid.

_____
(Company Name)

_____ _____
(Contractor's Signature) (Date)

STATE OF ALASKA)
)ss.
THIRD JUDICIAL DISTRICT)

The foregoing instrument was acknowledged before me this _____ day of _____, 20 ___, by _____ to be the _____ of the company.

_____
Notary Public
My commission expires: _____

State of Alaska
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Certification of Construction for Domestic Wastewater Systems

Instructions: Within 90 days after the construction, installation, or modification of a project is completed, the owner, the contractor(s) responsible for constructing the project, and a registered engineer responsible for construction inspection, must complete and sign this form declaring that the project was constructed in accordance with the most recent Department-approved plans, or in accordance with the attached as-built drawings.

If a project is being completed in phased construction, a map shall be attached showing that portion of the project being declared completed on the date stated in Section A - Owners Section. Completion of each phase of a project must be declared as it is completed. Additional Certification of Construction forms are available from any Department of Environmental Conservation office.

Please type or print, except for signatures

SECTION A- Owner's Section

Name and brief description of the project _____

_____

Owner Name _____

Owner Address _____

City State Zip

ADEC Project No. _____ Date Project Completed: _____

I certify that I am the owner of the above-referenced project. I further certify that this project was constructed in accordance with the latest plans submitted to and approved by the Alaska Department of Environmental Conservation (ADEC), or in accordance with the attached as-built drawings. I understand that I may be required to take remedial measures to correct any construction which was completed without prior ADEC approval, which departs from the approved plans, and which is found to be inconsistent with the applicable requirements of ADEC wastewater disposal regulations (18 AAC 72).

_____

Signature of Owner (Please Sign in Ink) **Date**

SECTION B- Contractor's Section

I certify that I (or an individual under my direct supervision) have conducted an inspection of the project referenced in Section A, or portions of the project which I had the responsibility for constructing, and that to the best of my knowledge and information, the project, or those portions, was or were constructed in accordance with the latest plans submitted to and approved by the Alaska Department of Environmental Conservation, or in accordance with the attached as-built drawings.

Printed Name of Contractor	**Signature of Contractor**	**Date**

For multiple contractors, if applicable:

Printed Name of Contractor	**Signature of Contractor**	**Date**
Printed Name of Contractor	**Signature of Contractor**	**Date**

SECTION C- Engineer's Section

I certify that I (or any individual under my direct supervision) have conducted an inspection of the above referenced project, and that to the best of my knowledge and information, the project was constructed in accordance with: (check one of the following)

[ ] the latest plans submitted to and approved by the Alaska Department of Environmental Conservation

or

[ ] in accordance with the attached as-built drawings.

I further certify that:

[ ] all conditions placed on the construction approval have been met as described briefly below: (if using a cover letter, you may write "*see cover letter*")

_____

_____

_____

Signature of Professional Engineer Responsible for Construction Inspection (Please Sign in Ink)	**State of Alaska Professional Engineer Registration Number**	**Date**

_____

Typed or Printed Name of Professional Engineer

STATE OF ALASKA
MUNICIPAL GRANTS & LOANS
ALASKA CLEAN/DRINKING WATER FUND

USE OF AMERICAN IRON AND STEEL

From the "Consolidated Appropriations Act, 2014" H.R. 3547
(PL113-76, enacted 1/17/2014) , and as codified under section 608 of the FWPCA (Federal Water Pollution Control Act)

"SEC. 436. (a)(1) None of the funds made available by a State water pollution control revolving fund as authorized by title VI of the Federal Water Pollution Control Act (33 U.S.C. 1381 et seq.) or made available by a drinking water treatment revolving loan fund as authorized by section 1452 of the Safe Drinking Water Act (42 U.S.C. 300j–12) shall be used for a project for the construction, alteration, maintenance, or repair of a public water system or treatment works unless all of the iron and steel products used in the project are produced in the United States.

(2) In this section, the term ''iron and steel products'' means the following products made primarily of iron or steel: lined or unlined pipes and fittings, manhole covers and other municipal castings, hydrants, tanks, flanges, pipe clamps and restraints, valves, structural steel, reinforced precast concrete, and construction materials.

(b) Subsection (a) shall not apply in any case or category of cases in which the Administrator of the Environmental Protection Agency (in this section referred to as the ''Administrator'') finds that—

(1) applying subsection (a) would be inconsistent with the public interest;

(2) iron and steel products are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality; or

(3) inclusion of iron and steel products produced in the United States will increase the cost of the overall project by more than 25 percent.

(c) If the Administrator receives a request for a waiver under this section, the Administrator shall make available to the public on an informal basis a copy of the request and information available to the Administrator concerning the request, and shall allow for informal public input on the request for at least 15 days prior to making a finding based on the request. The Administrator shall make the request and accompanying information available by electronic means, including on the official public Internet Web site of the Environmental Protection Agency.

(d) This section shall be applied in a manner consistent with United States obligations under international agreements.

(e) The Administrator may retain up to 0.25 percent of the funds appropriated in this Act for the Clean and Drinking Water State Revolving Funds for carrying out the provisions described in subsection (a)(1) for management and oversight of the requirements of this section.

(f) This section does not apply with respect to a project if a State agency approves the engineering plans and specifications for the project, in that agency's capacity to approve such plans and specifications prior to a project requesting bids, prior to the date of the enactment of this Act."

STATE OF ALASKA

MUNICIPAL GRANTS & LOANS

ALASKA CLEAN/DRINKING WATER FUND

USE OF AMERICAN IRON AND STEEL

CERTIFICATION BY THE OWNER

OF COMPLIANCE WITH THE

USE OF AMERICAN IRON AND STEEL LAW

enacted on 1/17/2014

(To be completed by the duly authorized Utility System representative and provided to the Municipal Grants & Loans (MGL) Program prior to start of construction.

We, the Owner (Utility System) named, _____, having obtained a loan from the State of Alaska Clean/Drinking Water State Revolving Fund, to fund the Project named _____ , and identified as Project # _____ hereby submit to the MGL Program, certification from each contractor working on the Project that the use of American Iron and Steel in the construction of the Project complies with the law, or that a waiver has been obtained from the U.S. Environmental Protection Agency.

_____	_____	_____
Signature of Official	Printed name	Date

Attachment: Certification by Owner

STATE OF ALASKA

MUNICIPAL GRANTS & LOANS

ALASKA CLEAN/DRINKING WATER FUND

USE OF AMERICAN IRON AND STEEL

CERTIFICATION BY BIDDER

OF COMPLIANCE WITH THE

USE OF AMERICAN IRON AND STEEL LAW

enacted on 1/17/2014

We, the bidding prime contractor and subcontractors, as named below, hereby certify that all the American iron and steel used in the Project named _____ _____, also identified as Project Loan No _____ will comply with the Use of American Iron and Steel Law, or obtain the necessary waiver(s) from the U.S. Environmental Protection Agency.

Prime Contractor Name: _____

_____	_____	_____
Signature of Official	Printed name	Date

Subcontractor Name	Signature of Official	Date
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

STATE OF ALASKA
MUNICIPAL GRANTS & LOANS
ALASKA CLEAN/DRINKING WATER FUND
USE OF AMERICAN IRON AND STEEL

Sample Step Manufacturer Certification

(Documentation must be provided on company letterhead)

Date

Company Name

Company Address

City, State Zip

Subject:

American Iron and Steel Step Manufacturer Certification for
Project Name _____

I, _____ (company representative), certify that the _____ (melting, bending, coating, galvanizing, cutting, etc.) process for _____ (manufacturing or fabricating) the following products and/or materials shipped or provided for the project is in full compliance with the American Iron and Steel requirement as mandated in EPA's State Revolving Fund Programs.

Item, Products and/or Materials:

1. _____

2. _____

3. _____

Such process took place at the following location: _____(address)

If any of the above compliance statements change while providing material to this project we will immediately notify the prime contractor and the engineer.

_____ _____ _____

Company representative Signature Date

DESIGN CLARIFICATION/VERIFICATION REQUEST (DC/VR)

PROJECT Pump Station 12 **DC/VR NO.** _____

CONTRACTOR _____ **CONTRACT NO.** _____

ORIGINATOR _____ **SPEC. SECTION** _____

DATE SUBMITTED _____ **DRAWING NO.** _____ **SHEET** _____ **OF** _____

DESCRIPTION OF DC/VR

RESPONSE REQUESTED BY (Date) _____

RESPONSE TO DC/VR

RESPONSE BY (Name/Company) _____

ROUTING	RECEIVED BY NAME / COMPANY	DATE RECEIVED	DATE FORWARDED	COMMENTS
Project Manager				
Designer				
Project Manager				
Contractor				

DIRECTION

☐ **Proceed per Engineers Response. No change in contract price or time is recognized.**

☐ **Do not proceed until** _____

☐ _____

DEVIATION REQUEST (DR)

PROJECT Pump Station 12 **DR NO.** _____

CONTRACTOR _____ **CONTRACT NO.** _____

ORIGINATOR _____ **SPEC. SECTION** _____

DATE SUBMITTED _____ **DRAWING NO.** _____ **SHEET** _____ **OF** _____

DESCRIPTION OF DR

A. Original Contract Requirements:

B. Reason for Deviation Request:

C. Proposed Deviation:

D. Any Changes in Contract Time or Cost ☐ **YES** ☐ **NO**

CONTRACTOR SIGNATURE -
Date_____

RESPONSE
REQUIRED BY (Date)_____

RESPONSE TO DR

RESPONSE BY (Name/Company)_____

ROUTING	RECEIVED BY NAME / COMPANY	DATE RECEIVED	DATE FORWARDED	COMMENTS
Project Manager				
Designer				
Project Manager				
Contractor				

DIRECTION

☐ **Approved**

☐ **Approved as Noted** **BY** _____
(Signature)

☐ **Disapproved**

SUBSTITUTION REQUEST (SR)

PROJECT Pump Station 12 **SR NO.** _____

CONTRACTOR _____ **CONTRACT NO.** _____

ORIGINATOR _____ **SPEC. SECTION** _____

DATE SUBMITTED _____ **DRAWING NO.** _____ **SHEET** _____ **OF** _____

SPECIFIED ITEM:

SECTION	PAGE	PARAGRAPH	DESCRIPTION

The undersigned requests consideration of the following:

PROPOSED SUBSTITUTION: _____

Attached data includes product description, specifications, drawings, photographs and performance and test adequate for evaluation of the request. Applicable portions of the data are clearly identified.

The undersigned states that the following paragraphs, unless modified on attachments, are correct:

1. The proposed substitution does not affect dimensions shown on Drawings and will not require any change in any of the Contract Documents.
2. The undersigned will pay for changes to the design, including engineering design, detailing, and construction costs caused by the requested substitution which is estimated to be $_____.
3. The proposed substitution will have no adverse affect on other contractors, the construction schedule (specifically the date of substantial completion), or specified warranty requirements.
4. Maintenance and service parts will be locally available for the proposed substitution.
5. The incorporation or use of the substitution in connection with the work is not subject to payment of any license fee or royalty.

The undersigned further states that the function, appearance, and quality of the Proposed Substitution are equivalent or superior to the Specified Item.

Submitted by CONTRACTOR	**Reviewed by ENGINEER**
Signature: _____	☐ **Accepted**
Firm: _____	☐ **Accepted as Noted**
_____	☐ **Not Accepted**
Date: _____	☐ **Received too Late**
Telephone: _____	
	By: _____
Attachments:	**Title:** _____
_____	**Date:** _____
_____	**Remarks:** _____

ANCHORAGE WATER AND WASTEWATER UTILITY

Subcontractor/Supplier List

Project Name: Pump Station 12

Project Number: WW.H7713

List all suppliers, subcontractors, their mailing addresses and a summary of the extent and character of the work to be performed by each:

Supplier/Subcontractor	Address	Extent/Character of Work

STARTUP AND PERFORMANCE EVALUATION FORM

OWNER: _____ PROJECT: _____

Unit Process Description: (Include description and equipment number of all equipment and devices):

Startup Procedure (Describe procedure for sequential startup and evaluation, including valves to be opened/closed, order of equipment startup, etc.):

Startup Requirements (Water, power, chemicals, etc.): _____

Evaluation Comments: _____

CONTRACTOR Certification that Unit Process is capable of performing its intended function(s), including fully automatic operation:

Firm Name: _____

Startup Representative: _____ Date: _____ , 2009
(Authorized Signature)

SUPPLEMENT

LOOP STATUS REPORT

Project Name:	Project No.

FUNCTIONAL REQUIREMENTS:

COMPONENT STATUS (Check & initial each item whencomplete)

Tag Number	Delivered	Tag ID Checked	Installation	Termination Wiring	Termination Tubing	Calibration	

REMARKS:

Loop Ready for Operation	By:	Date:	Loop No.:

CERTIFICATE OF INSTALLATION

Owner _____

Project _____

Contract No.
_____

EQUIPMENT SPECIFICATION SECTION _____

EQUIPMENT DESCRIPTION _____

EQUIPMENT TAG NO.s _____

I, _____, Authorized representative of
(Print Name)

_____
(Print Manufacturer's Name)

the undersigned manufacturer's representative, hereby certify that I am (i) a duly authorized representative of the manufacturer, (ii) empowered by the manufacturer to inspect, approve, and operate this equipment/system and (iii) authorized to make recommendations required to assure that the equipment/system furnished by the manufacturer is complete and operational, except as may be otherwise indicated herein. I further certify that all information contained herein is true and accurate.

I hereby CERTIFY that

_____
(Print equipment name and model with serial no.)

installed for the subject project has (have) been installed in a satisfactory manner, has (have) been tested and adjusted, and is (are) ready for final acceptance testing and operation on :

Date_____ Time_____

This is evidenced in the attached documents (check all that apply):

- ☐ Field test results with collected data and test report.
- ☐ Laboratory sampling and analytical testing report.
- ☐ Written certification report prepared by and signed by the electrical and/or instrumentation subcontractor.

CERTIFIED BY: _____ _____
(Print Name) (Signature of Manufacturer's Representative)

Signature Date:_____

Instrument Equipment Summary Form

Equipment Item: _____

Equipment Supplier: _____

Component Information: Nameplate Data
Manufacturer:
Serial No.:
Model/Part No.:
Size:
Function:
Span:
Set Point:
Reset Time:
Ration/Factor:
Input:
Output:
Rev/Dir:
Integral:
Proportional Band:
Derivative:
Lubrication Requirements (Type):
Recommended Spare Parts List (Provide on Separate Sheet)
Comments: _____

MAINTENANCE SUMMARY FORM

PROJECT: _____ CONTRACT NO.: _____

1. EQUIPMENT ITEM _____
2. MANUFACTUER _____
3. EQUIPMENT/TAG NUMBER(S) _____
4. WEIGHT OF INDIVIDUAL COMPONENTS (OVER 100 POUNSD) _____
5. NAMEPLATE DATA (hp, voltage, speed, etc.) _____
6. MANUFACTURER'S LOCAL REPRESENTATIVE _____
   a. Name _____ Telephone No. _____
   b. Address _____
7. MAINTENANCE REQUIREMENTS

Maintenance Operation Comments	**Frequency**	**Lubricant (If Applicable)**
List briefly each maintenance operation required and refer to specific information in manufacturer's standard maintenance manual, if applicable. (Reference to manufacturer's catalog or sales literature is not acceptable.)	List required frequency of each maintenance operation.	Refer by symbol to lubricant required.

8. LUBRICANT LIST

Reference Symbol	Tesoro	Chevron	Mobil	Shell	Or Equal
List symbols used in No. 7.	List equivalent lubricants, as distributed by each manufacturer for the specific use recommended.				

9. RECOMMEND SPARE PARTS FOR OWNERS'S INVENTORY.

Part No.	Description	Unit	Quantity	Unit Cost
Note: Identify parts provided by this Contract with two asterisks.				

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 SEWER IMPROVEMENTS

PUMP STATION 12 FORCE MAIN / INTERCEPTOR C GRAVITY JUNCTION REHABILITATION

SECTION V

CONTRACT AND BID DOCUMENTS

Contract

Bid Bond

Performance & Payment Bond

Certificate of Insurance

Bidder's Checklist

Subcontractor Information – EPA Funded Only

Certification of Nonsegregated Facilities – EPA Funded Only

Certification Regarding Debarment, Suspension and other Responsibility Matters – EPA Funded Only

C O N T R A C T

Invitation to Bid No. **2022C_____**

Contract No. **C-2022_____**

NAME AND ADDRESS OF CONTRACTOR:

_____

_____

_____

Check appropriate box:

☒ **Incorporated in the State of**

MUNICIPALITY OF ANCHORAGE, acting through _____ (hereinafter the Owner).

Contract for _____

BID SCHEDULES	**ITEMS**	**PLAN SHEET FILE NUMBERS**	**AMOUNT**
			$ _____

Total Amount : $ _____

THIS CONTRACT, entered into by the MUNICIPALITY OF ANCHORAGE, ALASKA, acting through the Owner named above, and the individual, partnership, or corporation named above, hereinafter called the Contractor, WITNESSETH that the parties hereto do mutually agree as follows:

Statement of Work: The Contractor shall furnish all labor, equipment and materials and perform the Work above described, for the amount stated, in strict accordance with the Contract Documents.

CONTRACT DOCUMENTS

I. This CONTRACT consisting of 4 pages.

II. The Bid Proposal Section ___ consisting of ____ pages numbered as ____, **as contained in ITB 2022C_____.**

III. The Contract Performance and Payment Bond **_____.**

IV. The Contractor's Certificate of Insurance Dated **_____.**

V. Municipality of Anchorage Standard Specifications dated 2015 (MASS) Incorporated by Reference, **as contained in ITB 2022C_____.**

VI. Specifications consisting of the following:

Supplemental Provisions Section _____ consisting of _____ pages, with attachments Exhibit A through F, **as contained in ITB 2022C_____.**

VII. Equal Opportunity Special Provisions and Forms Section _____ consisting of _____ pages, **as contained in ITB 2022C_____.**

VIII. Disadvantaged/Women-Owned Business Enterprise (DBE/WBE) Specification Section _____ consisting of _____ pages, **as contained in ITB 2022C_____.**

IX. The Laborers' and Mechanics' Minimum Rates of Pay dated September 1, 2015 Section _____ consisting of _____ pages, **as contained in ITB 2022C_____.**

X. Submittal List Section _____ consisting of _____ page, **as contained in ITB 2022C_____.**

XI. The Drawings consisting of _____ sheets numbered _____, **as contained in ITB 2022C_____.**

IN WITNESS WHEREOF, the parties hereto have executed this Contract as of the Contract Date entered below.

MUNICIPALITY OF ANCHORAGE, ALASKA

BY _____
Signature

Purchasing Officer or designee
Title

Date of Signature and Contract Date:

_____

VENDOR _____

BY _____
Signature

_____
Printed Name

_____
Title

_____
Date of Signature

CONTRACT AND PERFORMANCE AND PAYMENT BOND SIGNATURE INSTRUCTIONS

1. The full name and business of the Contractor shall be inserted on Page 1 of the Contract and on the Performance and Payment Bond, hereinafter the Bond.
2. Two copies of the Contract and the Bond shall be manually signed by the Contractor. If the Contractor is a partnership or joint venture, all partners or joint ventures shall sign the Contract and the Bond except that one partner or one joint venturer may sign for the partnership or joint venture when all other partners or joint venturers have executed a Power-of-Attorney authorizing one partner or joint venturer to sign. The Power-of-Attorney shall accompany the executed contract and the Bond.
3. If the Contractor is a corporation, the President of the corporation shall execute the Contract and the Bond unless a Power-of-Attorney or corporate resolution shall accompany the executed Contract and Bond.
4. The Bond shall be returned to the Purchasing Division undated. The Contract Date shall be inserted on the Contract when the Municipality signs the Contract and the Bond shall be dated the same as the Contract Date.

BID BOND

KNOW ALL MEN BY THESE PRESENTS, That we, _____ as Principal, and _____ a corporation organized under the laws of the _____ and authorized to transact surety business in the State of Alaska, of _____ _____ as Surety, are held and firmly bound unto the MUNICIPALITY OF ANCHORAGE, as Obligee, in the full and just sum of _____ _____ ($_____) Dollars, 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, jointly and severally, firmly by the presents.

WHEREAS, the said Principle is herewith submitting its proposal for _____ _____.

The condition of this obligation is such that if the aforesaid Principal will, within the time required enter into a formal contract and give a good and sufficient bond to secure the performance of the terms and conditions of the contract, then this Obligation to be void; otherwise the Principal and Surety will pay unto to the Obligee the amount stated above.

Signed, sealed, and delivered _____, 20_____.

WITNESS AS TO PRINCIPAL:

_____ _____
Contractor Name

_____
Contractor Signature

_____
(AFFIX CORPORATE SEAL) Corporate Surety

_____

_____
Surety Business Address

BY: _____
(Attorney-In-Fact)

(AFFIX SURETY SEAL)

CONTRACT PERFORMANCE AND PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS, That we _____

_____ of _____

as Principal, and _____

a corporation organized under the laws of the _____

_____ and authorized to transact surety business in the State of Alaska,

of _____

as Surety, are held and firmly bound unto the MUNICIPALITY OF ANCHORAGE, as Obligee, in the full and just sum of _____

($ _____) Dollars, lawful money of the UNITED STATES, for the payment which, well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITIONS OF THIS OBLIGATION IS SUCH, that whereas the principal has entered into a certain contract dated the _____ date of _____ 20 _____, with the Obligee for the construction of _____

_____

which contract is hereby referred to and made a part hereof as fully and to the same extent as if copied at length herein.

NOW THEREFORE, if the Principal shall well and truly perform and fulfill all the undertakings, covenants, terms, conditions, and agreements of said contract, and shall promptly make payments to all persons supplying labor and material in the prosecution of the work provided for in said contract, during the original term of said contract and any extensions of modifications thereof that may be granted by the Municipality, with or without notice to the Surety, then this obligation to be void; otherwise to remain in full force and effect.

This obligation is made for the use of said Obligee and also for use and benefit of all persons who may perform any work or labor or furnish any material in the execution of said Contract and may be sued on thereby in the name of said Obligee.

This said Surety, for the value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to the work to be performed thereunder or the specifications accompanying the same, shall in anywise affect its obligations on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the work or to the specifications.

Whenever Principal shall be, and declared by Obligee to be in default under the Contract the Obligee having performed Obligee's obligations thereunder, the Surety may promptly remedy the default or shall promptly:

1. Complete the Contract in accordance with its terms and conditions, or
2. Obtain a bid or bids for submission to Obligee for completing the Contract in accordance with its terms and conditions and upon determination by Surety of the lowest responsible bidder, or, if the Obligee elects, upon determination by Obligee and the Surety jointly of the lowest responsible bidder, arrange for a contract between such bidder and Obligee and make available as Work progresses (even though there should be a default or a succession of defaults under the contract or contracts of completion arranged under this paragraph) sufficient funds to pay the cost of completion less the balance of the contract price but not exceeding, including other costs and damages for which the Surety may be liable hereunder the amount set forth in the first paragraph hereof. The term "balance of the contract price" as used in this paragraph, shall mean the total amount payable by Obligee to Principal under the Contract and any amendments thereto, less the amount properly paid by Obligee to Principal.

IN TESTIMONY WHEREOF, the parties hereunto have caused the execution hereof in _____ _____ original counterparts as of the _____ day of _____, 20_____.

WITNESS AS TO PRINCIPAL:

_____ _____

Principal Name

_____

Principal Signature

(AFFIX CORPORATE SEAL) _____

Corporate Surety

_____

_____

Surety Business Address

(AFFIX SURETY SEAL) BY: _____

(Attorney-In-Fact)

INSURANCE

By submitting a bid, the bidder agrees, if they are the successful bidder, to obtain and maintain the insurance required by this section. The bidder also agrees to provide the Municipality a copy of their Certificate of Liability Insurance prior to signing the contract and prior to commencement of any work under this contract.

GENERAL: The Contractor will not allow any subcontractor to commence work until the subcontractor has obtained insurance as listed in this section. The contractor and each subcontractor shall maintain this insurance throughout the life of this contract, including any maintenance and/or guarantee/warranty period. The contractor shall obtain separate insurance certificates for each contract.

ADDITIONAL INSURED: The Municipality of Anchorage shall be listed as an additional insured on all General and Auto Liability policies required by this contract. All policies shall contain a waiver of subrogation against the Municipality, except Professional Liability. All policies shall remain in effect during the life of the contract. The Contractors insurance certificate shall also indicate the Municipality of Anchorage as a certificate holder of the policy.

WORKERS COMPENSATION: The Contractor shall purchase and maintain during the life of this contract, workers compensation insurance for all employees who will work on this project and, if any work is sublet, the Contractor shall require the subcontractor similarly to provide such insurance. Employers' Liability with a minimum limit of $500,000 shall be maintained and Workers Compensation with minimum limits as required by Alaska State Workers Compensation Statutes. The policy shall contain a waiver of subrogation against the Municipality.

NOTICE TO "OUT-OF-STATE" CONTRACTORS WORKING IN ALASKA: The Contractor shall provide evidence of Workers Compensation insurance, either State of Alaska Workers Compensation coverage or an endorsement to the Contractor's home state Workers Compensation policy, evidencing coverage for "other states" including Alaska, prior to execution of a contract or, if approved, before commencement of contract performance in Alaska.

GENERAL LIABILITY: The Contractor shall purchase and maintain, in force, during the life of this contract such general liability insurance as shall protect the Owner and the Contractor against losses which may result from claims for damages for bodily injury, including accidental death, as well as from claims for property damages which may arise from any operations under this contract whether such operations be those of the Contractor, a subcontractor or anyone directly or indirectly employed by either of them.

Commercial General Liability	**Minimum Limits**
Products/Completed Operations	$1,000,000
Personal & Advertising Injury	$1,000,000
Each Occurrence	$1,000,000
General Aggregate	$1,000,000
Medical Payments	$5,000
Commercial Auto Liability	**Minimum Limits**
Combined single limit (Bodily Injury and Property Damage)	$500,000
Including all owned, hired, and non-owned	
Workers Compensation and Employers Liability	**Minimum Limits**
Per Alaska statute	$500,000
Errors and Omissions	**Minimum Limits**
Professional Liability (Not required unless limits appear in space provided)	
Umbrella Liability	**Minimum Limits**
(Not required unless limits appear in space provided)	
$ _____ S.I.R.	

Each insurance policy required by this section shall require the insurer to give advance notice to the MOA/Contract Administrator prior to the cancellation of the policy. IF the insurer does not notify the MOA upon policy cancellation, it shall be the Contractor's responsibility to notify the MOA of such cancellation.

COMPLIANCE WITH LAWS

The Contractor shall observe and abide by all applicable laws, regulations, ordinances and other rules of the State of Alaska and/or any political subdivisions thereof, or any other duly constituted public authority wherein work is done or services performed, and further agrees to indemnify and save the Municipality of Anchorage harmless from any and all liability or penalty which may be imposed or asserted by reason of the Contractor's failure or alleged failure to observe and abide thereby.

(Remainder of Page Initially left Blank)

ACORD®

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)

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) shall 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:	
	PHONE (A/C, No, Ext):	FAX (A/C,
	E-MAIL ADDRESS:	

INSURED	INSURER(S) AFFORDING COVERAGE	NAIC #
	INSURER A :	
	INSURER B :	
	INSURER C :	
	INSURER D :	
	INSURER E :	
	INSURER F :	

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 INSR	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
	GENERAL LIABILITY						EACH OCCURRENCE	$
	☐ COMMERCIAL GENERAL LIABILITY						DAMAGE TO RENTED PREMISES (Ea occurrence)	$
	☐ CLAIMS-MADE ☐ OCCUR						MED EXP (Any one person)	$
	☐						PERSONAL & ADV INJURY	$
	☐						GENERAL AGGREGATE	$
	GEN'L AGGREGATE LIMIT APPLIES PER:						PRODUCTS - COMP/OP AGG	$
	☐ POLICY ☐ PRO- ☐ LOC							$
	AUTOMOBILE LIABILITY						COMBINED SINGLE LIMIT (Ea accident)	$
	☐ ANY AUTO						BODILY INJURY (Per person)	$
	☐ ALL OWNED AUTOS ☐ SCHEDULED AUTOS						BODILY INJURY (Per accident)	$
	☐ HIRED AUTOS ☐ NON-OWNED AUTOS						PROPERTY DAMAGE (Per accident)	$
								$
	☐ **UMBRELLA LIAB** ☐ OCCUR						EACH OCCURRENCE	$
	☐ **EXCESS LIAB** ☐ CLAIMS-						AGGREGATE	$
	☐ DED ☐ RETENTION $							$
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY Y / N						☐ WC STATU-TORY LIMITS ☐ OTH-ER	
	ANY PROPRIETOR/PARTNER/EXECUTIVE ☐ N / A						E.L. EACH ACCIDENT	$
	OFFICER/MEMBER EXCLUDED? **(Mandatory in NH)** If yes, describe under DESCRIPTION OF OPERATIONS below						E.L. DISEASE - EA	$
							E.L. DISEASE - POLICY LIMIT	$

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (Attach ACORD 101, Additional Remarks Schedule, if more space is required)

1. The Municipality of Anchorage is an additional insured on Auto and General Liability policies. All policies, including workers compensation, contain a WAIVER OF SUBROGATION against the Municipality, except Professional Liability, .
2. 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."

CERTIFICATE HOLDER

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

BIDDER'S CHECKLIST

INSTRUCTION TO BIDDER

I. GENERAL:

Bidders are advised that notwithstanding any instructions or implications elsewhere in this Invitation to Bid only the documents shown and detailed on this sheet need be submitted with and made part of their bid. Other documents may be required to be submitted after bid time, but prior to award. Bidders are hereby advised that failure to submit the documents shown and detailed on this sheet shall be justification for rendering the bid nonresponsive. Evaluation of bids for responsiveness shall be accomplished in accordance with Anchorage Municipal Code, Title 7.

II. REQUIRED DOCUMENTS FOR BID

NOTE: "Only the following listed items as marked with an "X" are required to be completely filled out and submitted with the bid."

__X__ Bid Proposal consisting of six (6) pages numbered BP-1 of 6 through BP-6 of BP 6. Bid Proposal Page **BP-2 of 6 must** be manually signed.

__X__ Erasures or other changes made to the Bid Proposal Sheet must be initialed by the person signing the bid.

__X__ Bid Bond, certified check, cashier's check, money order or cash shall be submitted with the bid in the amount indicated.

__X__ All Addenda issued shall be acknowledged in the space provided on the Bid Proposal sheet or by manually signing the Addenda sheet and submitting it prior to the bid opening in accordance with Anchorage Municipal Code 7.20.020C.

__X__ Subcontractor Information (See Section V).

__X__ USEPA Certification of Nonsegregated Facilities (See Section V).

__X__ USEPA Certification Regarding Debarment, Suspension, and Other Responsibility Matters (See Section V).

__X__ ADEC DBE Compliance Statement (See Section IX, Appendix B).

__X__ DBE Subcontractor Performance Form (AWWU FORM 6100-3), **FOR EACH PROPOSED DBE SUBCONTRACTOR.** If no DBE subcontractors are proposed, the form must still be signed by the bidder (See Section IX, Appendix C).

BIDDER'S CHECKLIST

INSTRUCTION TO BIDDER

CONTINUED

III. REQUIRED DOCUMENTS AFTER BID OPENING

The following documents are required within **five (5)** working days of notification by the Purchasing Office. Failure, in whole or in part, to submit the documents required below may be grounds to determine the Bidder as non-responsible.

X DBE Subcontractor Utilization Form (AWWU FORM 6100-4) (See Section IX, Appendix D)

X State of Alaska Department of Environmental Conservation Equal Employment Opportunity Statement of Acknowledgement Form for the bidder and each proposed subcontractor, **REGARDLESS OF DBE PARTICIPATION** (See Section X, first page).

X In accordance with AO No. 2019-130 (S), Anchorage Municipal Code 7.20.030 and 7.20.070, Contractor Questionnaire consisting of three (3) Pages, Prime Contractor Form Filled out by Prime Contractor **and** all known subcontractors. **Please review AO NO. 2019-130 (S), AMC 7.20.030 and 7.20.070, and the attached Contractor Questionnaire before submitting a bid.**

Municipality of Anchorage
Contractor Questionnaire

Contractors/Vendors wishing to qualify for award of a bid or proposal offered by the Municipality of Anchorage shall submit this completed form and any supplemental information requested by this form within five days following a request by the Purchasing Officer.

This form is to be filled out by the prime, and subcontractors that perform work "on-site". On-site is defined as the physical place or places where the building or work called for in the contract will remain, and any other site where a significant portion of the building or work is constructed, provided that such site is established specifically for the performance of the contract or project.

Contractor/Vendor Name: _____

Owner(s) of Company (if sole proprietorship or partnership): _____

_____

List all Alaska construction contractor's registration numbers, registration types and expiration dates of the Alaska business licenses held by your company in the past three years:

_____

_____

Has your company changed names, business license number, or contractor registration number in the past three years?

☐ Yes ☐ No

If "Yes," explain on a separate signed page, including the reason for the change.

Has any owner, partner or (for corporations) officer of your company operated any business offering similar services outlined in the bid or proposal under any other name in the past three years?

☐ Yes ☐ No

If "Yes," explain on a separate signed page, including the reason for the change.

Certifications & Disclosures

For these questions & certifications, "company" includes any entity that shares or has shared majority ownership or control with your company. "Determination of violation" includes any citations, orders or recommendations issued to or against the company.

Debarment

1. In the last three years has your company been debarred from bidding on, or being awarded, a state or federal project?

   ☐ Yes ☐ No

Occupational Safety & Health

Note: Only willful violations of state or federal occupational safety and health laws will result in disqualification; disclosure of other violations does not lead to automatic disqualification.

2. In the last three years has your company been determined to have committed a **willful violation** of state or federal occupational safety and health law? For purposes of this question, a state or federal occupational safety and health law includes laws enforced by the Occupational Safety and Health Administration (OSHA), Alaska Occupational Safety and Health (AKOSH), or another state's occupational safety and health agency.

☐ Yes ☐ No

3. In the last three years, has the federal Occupational Safety and Health Administration (OSHA), Alaska Occupational Safety and Health (AKOSH), or another state's occupational safety and health agency, made a determination of violation against your company?

Note: If you have filed an appeal of a citation and the appropriate appeals board has not yet ruled on your appeal, you need not include information about it.

☐ Yes ☐ No

If "Yes," attach a separate signed page describing each citation.

Wage & Hour

Note: Only willful violations of state or federal wage and hour laws will result in disqualification; disclosure of other violations does not lead to automatic disqualification.

4. In the last three years has your company been determined to have committed a **willful violation** of state or federal wage and hour law?

☐ Yes ☐ No

5. In the last three years has there been a determination of violation of wage and hour laws against your company? Wage and hour violations include failure to pay minimum wages, overtime, or prevailing wages.

☐ Yes ☐ No

If "Yes," attach a separate signed page describing each violation, identifying the claim by claimant, date, and status/outcome.

Unemployment Insurance & Workers' Compensation

6. In the last three years has there been a determination of violation of unemployment insurance or workers' compensation requirements against your company?

☐ Yes ☐ No

If "Yes," attach a separate signed page describing each violation, identifying the claim by claimant, date, and status/outcome.

Licensing & Registration

7. If a license or certificate of fitness is required to perform any services provided by your company, has there been a determination of violation of any certificate of fitness requirements against your company in the last three years?

☐ Yes ☐ No

If "Yes," attach a separate signed page describing each violation, identifying the claim by claimant, date, and status/outcome.

Subcontracting

8. I certify that all independent subcontractors engaged by my company meet the definition of an independent contractor under Alaska Statute 23.30.230.

☐ Yes ☐ No

9. I understand that my company is responsible for ensuring that each subcontractor my company uses on the project completes this form and associated documentation. I will submit any disclosures required by Anchorage Municipal Code.

☐ I understand

10. I understand that my company is responsible for providing this form and any associated documentation for each subcontractor hired after award within 30 days of hire, and that the subcontractor may not begin work on the project until such information is provided.

☐ I understand

11. I understand that my company is responsible for ensuring that if any event, such as a violation or loss of coverage, causes the information submitted by the subcontractor to change, the subcontractor shall submit updated certifications or disclosures within 30 days of occurrence to the department contract administrator.

☐ I understand

I declare under penalty of perjury that the foregoing is true and correct.

Dated: _____ _____
(Signature)

_____
(Printed name and title)

Right to Appeal: Anchorage Municipal Code provides that any person adversely affected in connection with the award of a municipal contract, including the Municipality's determination on responsibility, may request that the mayor or assembly refer the matter to the bidding review board.

SUBCONTRACTOR INFORMATION

As a condition of using Federal assistance on this project, AWWU is required to capture subcontractor information from prime proposers. The Proposer is required to provide the information below for each and every subcontractor who provided them a bid or quote for this project.

This information shall be submitted with the Proposal. Failure to submit this information with the bid shall be justification to reject the proposal as non-responsive.

Subcontractor Name: _____

Point of Contact: _____

Mailing Address: _____

_____

_____

Phone Number: _____

E-mail Address: _____

Date of Subcontractor Bid/Quote: _____

MBE _____ WBE _____ NON-MBE OR WBE _____

Subcontractor Name: _____

Point of Contact: _____

Mailing Address: _____

_____

_____

Phone Number: _____

E-mail Address: _____

Date of Subcontractor Bid/Quote: _____

MBE _____ WBE _____ NON-MBE OR WBE _____

Subcontractor Name: _____

Point of Contact: _____

Mailing Address: _____

_____

_____

Phone Number: _____

E-mail Address: _____

Date of Subcontractor Bid/Quote: _____

MBE _____ WBE _____ NON-MBE OR WBE _____

Subcontractor Name: _____

Point of Contact: _____

Mailing Address: _____

_____

_____

Phone Number: _____

E-mail Address: _____

Date of Subcontractor Bid/Quote: _____

MBE _____ WBE _____ NON-MBE OR WBE _____

Subcontractor Name: _____

Point of Contact: _____

Mailing Address: _____

_____

_____

Phone Number: _____

E-mail Address: _____

Date of Subcontractor Bid/Quote: _____

MBE _____ WBE _____ NON-MBE OR WBE _____

Subcontractor Name: _____

Point of Contact: _____

Mailing Address: _____

_____

_____

Phone Number: _____

E-mail Address: _____

Date of Subcontractor Bid/Quote: _____

MBE _____ WBE _____ NON-MBE OR WBE _____

Subcontractor Name: _____

Point of Contact: _____

Mailing Address: _____

_____

_____

Phone Number: _____

E-mail Address: _____

Date of Subcontractor Bid/Quote: _____

MBE _____ WBE _____ NON-MBE OR WBE _____

Subcontractor Name: _____

Point of Contact: _____

Mailing Address: _____

_____

_____

Phone Number: _____

E-mail Address: _____

Date of Subcontractor Bid/Quote: _____

MBE _____ WBE _____ NON-MBE OR WBE _____

Subcontractor Name: _____

Point of Contact: _____

Mailing Address: _____

_____

_____

Phone Number: _____

E-mail Address: _____

Date of Subcontractor Bid/Quote: _____

MBE _____ WBE _____ NON-MBE OR WBE _____

Subcontractor Name: _____

Point of Contact: _____

Mailing Address: _____

_____

_____

Phone Number: _____

E-mail Address: _____

Date of Subcontractor Bid/Quote: _____

MBE _____ WBE _____ NON-MBE OR WBE _____

Subcontractor Name: _____

Point of Contact: _____

Mailing Address: _____

_____

_____

Phone Number: _____

E-mail Address: _____

Date of Subcontractor Bid/Quote: _____

MBE _____ WBE _____ NON-MBE OR WBE _____

Subcontractor Name: _____

Point of Contact: _____

Mailing Address: _____

_____

_____

Phone Number: _____

E-mail Address: _____

Date of Subcontractor Bid/Quote: _____

MBE _____ WBE _____ NON-MBE OR WBE _____

Subcontractor Name: _____

Point of Contact: _____

Mailing Address: _____

_____

_____

Phone Number: _____

E-mail Address: _____

Date of Subcontractor Bid/Quote: _____

MBE _____ WBE _____ NON-MBE OR WBE _____

Subcontractor Name: _____

Point of Contact: _____

Mailing Address: _____

_____

_____

Phone Number: _____

E-mail Address: _____

Date of Subcontractor Bid/Quote: _____

MBE _____ WBE _____ NON-MBE OR WBE _____

CERTIFICATION OF NONSEGREGATED FACILITIES

(Applicable to federally assisted construction contracts and related subcontracts exceeding $10,000 which are not exempt from the Equal Opportunity clause.)

The federally assisted construction contractor certifies that he does not maintain or provide for his employees any segregated facilities at any of his establishments, and that he does not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. The federally assisted construction contractor certified, further that he will not maintain or provide for his employees any segregated facilities at any of his establishments, and that he will not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. The federally assisted construction contractor agrees that a breach of this certification is a violation of the Equal Opportunity clause in this contract.

As used in this certification, the term "segregated facilities" means any waiting rooms, work area, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive or area, in fact, segregated on the basis of race, creed, color, or national origin, because of habit, local custom, or otherwise. The federally assisted construction contractor agrees that (except where he has obtained identical certifications from proposed contractors for specific time periods) he will obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity clause, and that he will retain such, certification in this file.

_____ _____

Signature Date

_____

Name and title of signer (please type)

U.S. Environmental Protection Agency

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:

(a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;

(b) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(c) Are not presently indicted for or otherwise criminally or civilly charged by a government entity (Federal, State, or local) with commission of any of the offenses enumerated in paragraph (1)(b) of this certification; and

(d) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State, or local) terminated for cause or default.

I understand that a false statement on this certification may be grounds for rejection of this proposal or termination of the award. In addition, under 18 USC Sec. 1001, a false statement may result in a fine of up to $10,000 or imprisonment for up to 5 years, or both.

_____

Typed Name & Title of Authorized Representative

_____ _____

Signature of Authorized Representative Date

☐ I am unable to certify to the above statements. My explanation is attached.

EPA Form 5700-49 (11-88)

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 SEWER IMPROVEMENTS

PUMP STATION 12 FORCE MAIN / INTERCEPTOR C GRAVITY JUNCTION REHABILITATION

SECTION VI

BID PROPOSAL

BID PROPOSAL
(CERTIFICATION)

TO: MUNICIPALITY OF ANCHORAGE _____, 2022
PURCHASING DEPARTMENT
632 W. 6TH AVENUE, SUITE 520
ANCHORAGE, ALASKA 99501

SUBJECT: Invitation to Bid No. 2022C035

PROJECT TITLE: Pump Station 12 Improvements

Pursuant to and in compliance with subject Invitation to Bid, and other bid documents relating thereto, the bidder hereby proposes to furnish all labor and materials and to perform all work for the construction of the above referenced project in strict accordance with the bid documents at the prices established in the Bid Proposal, page **BP- 1 of 6 through BP- 6 of 6** submitted herewith.

The bidder agrees, if awarded the contract, to commence and complete the work within the time specified in the bid documents.

The bidder acknowledges receipt of the following addenda:

Addenda No._____ Addenda No. _____
Addenda No._____ Addenda No. _____
Addenda No._____ Addenda No. _____

Enclosed is a Bid Bond in the amount of _____.
(Dollar Amount or Percentage of Bid)

Type of Business Organization
The bidder, by checking the applicable box, represents that it operates as ( ) a corporation incorporated under the laws of the State of _____, ( ) an individual, ( ) an LLC, ( ) a partnership, ( ) a nonprofit organization, or ( ) a joint venture. If a partnership or joint venture, identify all parties on a separate page.

Is this project Federally Funded?
Yes ☐
No ☐

_____
Company Name

BID PROPOSAL
(CERTIFICATION)
Continued

SUBJECT: Invitation to Bid No. 2022C035

PROJECT TITLE: Pump Station 12 Improvements

Date	Alaska Contractor's License Number
Company Name (Printed)	Employer's Tax Identification Number
Authorized Representative Signature	Printed Name & Title
Company **Mailing** Address	Company Phone Number
City, State, Zip Code	Company Fax Number
Company **Physical** Address (if different from mailing address)	Company Email Address
City, State, Zip Code	

MUNICIPALITY OF ANCHORAGE
ANCHORAGE WATER & WASTEWATER UTILITY
PUMP STATION 12 FORCE MAIN / INTERCEPTOR C GRAVITY JUNCTION REHABILITATION
BID PROPOSAL

Schedule	Description	Bid Amount
	BASIC BID	
A	Pump Station 12 Rehabilitation	
C	Access Drives	
D	Force Main Rehabilitation	

TOTAL BASIC BID: _____

CONTRACTOR'S NAME: _____

DATE: _____

MUNICIPALITY OF ANCHORAGE
ANCHORAGE WATER & WASTEWATER UTILITY
PUMP STATION 12 FORCE MAIN / INTERCEPTOR C GRAVITY JUNCTION REHABILITATION
BID PROPOSAL

Schedule A - Basic Bid: PUMP STATION 12 REHABILITATION

ITEM NO.	SPEC. NO.	WORK DESCRIPTION	ESTIMATED QUANTITY	UNIT BID PRICE	TOTAL BID PRICE
A-1	50.11	Construct Pump Station 12 Improvements per Lump Sum	1		

Total Schedule A - Basic Bid: PUMP STATION 12 REHABILITATION: _____

CONTRACTOR'S NAME: _____

DATE: _____

MUNICIPALITY OF ANCHORAGE
ANCHORAGE WATER & WASTEWATER UTILITY
PUMP STATION 12 FORCE MAIN / INTERCEPTOR C GRAVITY JUNCTION REHABILITATION
BID PROPOSAL

Schedule C - Basic Bid: ACCESS DRIVES

ITEM NO.	SPEC. NO.	WORK DESCRIPTION	ESTIMATED QUANTITY	UNIT BID PRICE	TOTAL BID PRICE
C-1	50.13	Construct Access Drives per Lump Sum	1		

Total Schedule C - Basic Bid: ACCESS DRIVES _____

CONTRACTOR'S NAME: _____

DATE: _____

MUNICIPALITY OF ANCHORAGE
ANCHORAGE WATER & WASTEWATER UTILITY
PUMP STATION 12 FORCE MAIN / INTERCEPTOR C GRAVITY JUNCTION REHABILITATION
BID PROPOSAL

Schedule D - Basic Bid: FORCE MAIN REHABILITATION

ITEM NO.	SPEC. NO.	WORK DESCRIPTION	ESTIMATED QUANTITY	UNIT BID PRICE	TOTAL BID PRICE
D-1	50.03	Construct Sanitary Sewer Manholes (Type B) per Lump Sum	1		
D-2	50.09	Slipline 48" Gravity Sewer per Lump Sum	1		
D-3	50.14	Furnish and Install CIPP Force Main Liners (20" & 24") per Lump Sum	1		
D-4	50.14	Furnish and Install CIPP Force Main Spot Repair (20" & 24") per Each	5		

Total Schedule D - Basic Bid: FORCE MAIN REHABILITATION _____

CONTRACTOR'S NAME: _____

DATE: _____

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 SEWER IMPROVEMENTS

PUMP STATION 12 FORCE MAIN / INTERCEPTOR C GRAVITY JUNCTION REHABILITATION

SECTION VII

OTHER UTILITY REQUIREMENTS

CEA Facility Requirements

ENSTAR Safety Requirements

CHUGACH
POWERING ALASKA'S FUTURE

December 7, 2020

ELECTRICAL FACILITY CLEARANCE REQUIREMENTS

Enclosed please find a copy of Chugach Electric Association, Inc.'s (Chugach) Electrical Facility Clearance Requirements policy. Periodically, copies of this policy are mailed out to various companies and agencies whose activities may bring their personnel in close proximity to Chugach's electrical facilities. Chugach distributes copies of this policy in an effort to help minimize and identify potential hazards for construction personnel and the general public. In addition, Chugach is concerned with preventing damage to its electrical facilities and any disruption of electrical service to its customers. Please note that the Electrical Facility Clearance Requirements publication may be found on Chugach's website at: www.chugachelectric.com. Click on the "Member Services" tab and go to "Regulations & Requirements", click on "Electrical Facility Clearance Requirements" (December 7, 2020).

For your additional information, Alaska State Statute ("AS 42.30.400 " Excavator's Notice of Proposed Excavation") has been included as an attachment.

Please thoroughly read and understand the entire document. It could save your life or the life of your employees and the public. We request that particular attention be paid to the following provisions:

(Paragraph B. 2.) "Under no circumstances will Chugach allow any of its underground cable(s) to remain energized after it has been exposed, unless it is protected by supplementary mechanical protection approved by Chugach or unless a *qualified person* is on site at all times".

(Paragraph H. 7.) "Chugach defines a *qualified person* as a journeyman lineman who holds a current Certificate of Fitness in the Journeyman Lineman category issued by the State of Alaska". These two provisions clearly emphasize Chugach's position relating to the exposure and approach to energized facilities.

Chugach strongly recommends that prior coordination takes place between Chugach and the construction entity or contractor , either during the design phase of a project or prior to the start of construction, to help eliminate or minimize conflicts. If you have questions, please contact the Line Operations Division at (907) 762-7679 and your call will be directed to the appropriate department for assistance.

Sincerely,

James Mullican

James Mullican
Senior Manager Line Operations

Enclosures

cc: MOA Development Services; State of Alaska OSHA Inspector; SOA Electrical Inspector; AGC, Cook Inlet Housing, GCI, ACS, Enstar, AWWU, Anchorage Home Builders Association

Chugach Electric Association, Inc.
5601 Electron Drive, P.O. Box 196300, Anchorage, Alaska 99519-6300 • (907) 563-7494 • Fax (907) 562-0027 • (800) 478-7494
www.chugachelectric.com

CHUGACH ELECTRIC ASSOCIATION, INC.

CLEARANCE REQUIREMENTS
FOR CONSTRUCTION OR MAINTENANCE NEAR ELECTRICAL FACILITIES

Chugach's concern for the safety of non-qualified personnel working adjacent to its electrical facilities, its concern for the public in general, and its requirement that only *qualified personnel* under the employ of *qualified electrical contractors* handle electrical facilities such as conductors, cables, poles, transformers, padmounted equipment, etc., is based upon the following considerations:

- The potential for serious injury and resulting liability is extremely high when dealing with all electric utility voltage levels up to 230,000 volts on overhead and underground lines.

- Certain types of equipment, particularly cable, can easily be damaged by improper handling. For example, when cable is hit or improperly suspended (common during excavation adjacent to cables), the scraped, cut, or stressed insulation will almost always result in premature cable failure. The highest risk to unqualified personnel is a cable failure while the cable is being handled during excavation or construction. Undetected cable damage may result in a subsequent cable failure with consumer outages for periods of up to a week's duration during winter conditions.

- The inherent stability of overhead pole lines or padmounted equipment is jeopardized with improper excavation and backfill, often resulting in hazardous voltage exposure to the public and contractors and leads to consumer power outages.

The above concerns can be minimized by the use of properly trained, licensed, and certified electrical outside linework personnel. The National Electrical Safety Code (NESC), the United States Occupational Safety and Health Administration (OSHA) and the Alaska State OSHA support this position as well as the clearances addressed herein.

The NESC, defines *"qualified"* as *"Having been trained in and having demonstrated adequate knowledge of the installation, construction, or operation of lines and equipment and the hazards involved, including identification of and exposure to electric supply and communication lines and equipment in or near the workplace*." Only qualified persons are permitted to handle or work on or adjacent to energized electrical facilities. This includes not only overhead pole lines but also padmounted

and underground facilities. Within the NESC, two rules specifically address the need for qualified persons to perform work on or near energized facilities:

> Rule 420B1 states, *"Employees whose duties require working on or in the vicinity of energized equipment or lines shall perform only those tasks for which they are trained, equipped, authorized, and so directed. Inexperienced employees shall: (a) work under the direction of an experienced and qualified person at the site; and (b) perform only directed tasks."*
>
> Rule 420B4 states, *"Employees who do not normally work on or in the vicinity of electric supply lines and equipment but whose work brings them into these areas for certain tasks shall proceed with this work only when authorized by a qualified person."*

OSHA 29CFR 1910.269 contains the training and documentation requirements for a qualified person.

OSHA 29CFR 1926.1408 addresses equipment operations near electrical lines. If any part of the equipment, when operated up to the equipment's maximum working radius, could get closer than twenty (20) feet to a power line, then the operator must notify the utility, verify line voltage, and implement one of the safety options in OSHA 29CFR 1926.1408.

At no time may equipment violate minimum required clearance to an energized power line: ten (10) feet for lines up to 50 kilovolts (kV), or ten (10) feet plus 0.4 inches per one (1) kV over 50 kV. Minimum clearances are provided below for common Chugach system voltages.

CHUGACH SYSTEM VOLTAGES	
Normal Voltage (Phase-to-Phase)	**Minimum Clearance Required At All Times**
Operations Near High-Voltage Overhead Power Lines to 50 kV	10 Feet
Over 50 kV to 200 kV	15 Feet
Over 200 kV to 350 kV	20 Feet

Specifically, 29CFR1926.1408 (b)(4)(ii) requires a "Safety Observer" during equipment operations if the equipment is operating where it is difficult for the operator to maintain twenty (20) feet of clearance to the overhead power line(s) by visual means. Alaska Statutes (AS) Sections 18.60.670 through Section 18.60.695 govern placement and operation of equipment near electrical lines or conductors. 29CFR1926, Subpart P addresses the specific requirements involved with trenching operations. These include prior notice to utility companies, prior location of utility facilities, and proper supports once the facilities are exposed. Furthermore, 29CFR Sections 1910.180; 1910.333; 1926.416; and 1926.651 regulate activities relative to job site electrical facilities.

In summary, Chugach's concern for the safety of all personnel affected by work adjacent to its energized facilities has led to the development of the attached policy.

ELECTRICAL FACILITY CLEARANCE REQUIREMENTS

The following requirements have been developed to help provide a safer work site to those personnel working adjacent to Chugach's electrical facilities and to protect Chugach facilities that are in proximity to the area of work being done by State or Municipal entities and private construction and maintenance projects.

A. NOTIFICATION

It is recommended that Chugach be informed of construction/maintenance activities as early as possible in the design process and be included in timely plan reviews. Any work that needs to be performed on Chugach facilities must have prior Chugach approval.

1. Overhead Facilities

Any work in the proximity of overhead power lines shall be preceded by a call to Chugach at (907) 762-7679 , at least 48 hours in advance, as notification of the planned work and compliance with OSHA 29CFR1926 (1408), and AS 18.60.670. If equipment, tools, machinery, or material must work in proximity closer than the minimum clearances outlined in OSHA 29CFR1926 (1408), and AS 18.60.670, the requirements of AS 18.60.680 shall be implemented before work can proceed. All necessary arrangements with Chugach by the requesting party for compliance with AS 18.60.680 shall be arranged in advance of the project start date.

2. Underground Facilities

Alaska Statutes 42.30.400 through 42.30.490, Anchorage Municipal Code, 24.40 and 26.90, and 29CFR1926, Subpart P place requirements on contractors who will be excavating around or adjacent to underground utilities. Advance notification requirements, underground facility locates, and the responsibilities for protection of utility facilities by contractors are specified in these regulations. All requests for locates of Chugach's underground facilities are to be made through the Alaska Digline at 811. Prior to excavation, Chugach's Line Operations Department shall be contacted at (907) 762-7679 a minimum of two (2) business days in advance of construction.

Locate surface markings are only reasonably accurate to +/- two (2) feet. Chugach and State law require hand-digging within two (2) feet of locate marks. In some cases, hand-digging may be required within three (3) or four (4) feet of the markings, depending on the facility involved and field

conditions at the project site. Maintaining locate marks is the responsibility of the party requesting the locate. Chugach may charge for re-locating and re-marking facilities that were previously marked.

B. UNDERGROUND CABLE EXCAVATION

1. Any excavation which is within a three (3) foot radius of a cable and parallels a cable for a distance greater than twenty (20) feet in length (see Section H.1 below) may require relocation of that cable. Excavations shorter in length and/or closer may also require relocation. At a minimum, cables that will require exposure must be exposed by *hand-digging* only, by a *qualified person* under the employ of a *qualified electrical contractor* (see Section H). See Drawing No. F-062388 attached.

2. Any excavation, such as a trench which crosses cable and/or conduit, shall be limited to twenty (20) feet in width and have provisions for the exposed cable/conduit to be supported every two (2) feet on a Chugach approved support system, to prevent cable damage. The cable support work and excavation within the three (3) foot radius (see Section H-1) shall be performed by a *qualified* person under the employ of a *qualified electrical contractor*.

   NOTE: When excavation must occur within the limits specified in B.1, and B.2, above, reasonable efforts will be made by Chugach to de-energize the cable if system conditions and personnel requirements allow. Even if the cable has been de-energized, a "Cable Watch" by a qualified person under the employ of a qualified contractor is still required. To request the de-energization of the cable, contact the Chugach Line Operations Department at (907) 762-7679 and your call will be directed to the appropriate department for assistance. Requests must be made three (3) business days in advance of the outage date requested. For emergencies, contact Chugach's Dispatch Center at (907) 762-4660.

   Under no circumstances will Chugach allow any of its underground cable(s) to remain energized after it has been exposed, unless it is protected by supplementary mechanical protection approved by Chugach or unless a qualified person is on site at all times.

3. Should any cable be exposed by non-qualified personnel, Chugach must be immediately contacted for field investigation before work may resume in the immediate area of such exposed cable.

Chugach recognizes that reasonable continuation of work may be required around energized underground cables after Chugach inspects the site. When this occurs, it is the responsibility of the construction contractor working at the site to arrange for qualified personnel as well as payment of the costs of said personnel and/or equipment. Chugach will neither arrange for, nor provide qualified personnel to satisfy this requirement unless Chugach determines this course of action is in its best interest, on a case-by-case basis. Where Chugach is otherwise forced to subsequently take steps to ensure the safety of the site, Chugach will advise the construction contractor that Chugach will pass these costs to the construction contractor.

4. In all cases, a final minimum burial depth of forty (40) to sixty (60) inches for primary-voltage (above 1000 volts) circuits and thirty (30) inches for secondary voltage (480V or below) circuits shall be maintained. If, however, existing Federal, State, or Municipal permit conditions require depths in excess of forty (40) inches, then the cable/conduit shall be buried at the depth required in the permit. The depth is measured from the top of the cable/conduit to final grade at the shallowest depth. Burial shall be in compliance with Chugach Construction Standard SUR 2-3, 5 or 6 (supplied upon request).

5. Projects that will increase final grade to sixty (60) inches or greater above Chugach direct buried cable shall require relocation at the customer's expense. Where cables are in conduit, review and written approval by Chugach is required for proposed grade changes resulting in a burial depth of sixty (60) inches or greater.

6. Projects which propose to modify the grade over Chugach's underground cables/circuits at voltages above 25kV require review and written approval by Chugach in all cases.

7. Excavations near underground cable/circuits energized above 25kV will require the following:

   a) Excavation Adjacent to Cables/Circuits Energized Above 24kV
   Chugach will require its Locate Contractor to notify excavators when a locate request includes the locating of cables are energized above 25kV.

   When excavation is planned that will come within ten (10) feet, expose, parallel, or undermine sections of Chugach's underground cables energized above 25kV, special precaution and safety

consideration must be taken. These distribution and sub-transmission cables operate at voltages of 34.5kV (34,000 volts) and transmission cables operate above 34.5kV up to 230kV (230,000 volts), provide power to tens of thousands of Chugach customers and require extraordinary protection. The following guidelines shall apply:

Chugach Line Operations Department shall be contacted at (907) 762-7679 in advance of the planned excavation a minimum of five (5) business days prior to beginning excavation. Chugach requires that a *qualified person* be on site at all times during excavation activity that comes within ten (10) feet of any circuit cable energized above 24kV. The contractor shall arrange and pay for a *qualified person* from Chugach or, with approval, from one of Chugach's approved and *qualified contractors*. Excavations closer than ten (10) feet shall require exposure of the cables (vac-truck, pot-holing or other approved means) at the intersecting point or at intervals of not less than every twenty-five (25) feet for parallel excavations by *qualified personnel* to determine the exact location of the cable prior to machine excavation.

Excavations within ten (10) feet of cables energized above 25kV can expose unqualified workers to potentially high fault currents and extremely unsafe conditions. Prior planning by the construction contractor with coordination and approval from Chugach for any excavation projects within ten (10) feet of circuits or cables energized above 25kV is mandatory.

Chugach may require a special locate utilizing Ground Penetrating Radar to locate critical facilities. "Pothole" locates utilizing vacuum excavation in conjunction with an air-knife tool may be used, with Chugach approval.

C. STRUCTURE EXCAVATION

1. Equipment Pads or Vaults

Temporary excavation is allowed with a maximum slope of 1:1 beginning three (3) feet from the exterior edge of a concrete pad or vault. The final grade shall consist of a level area radiating out a minimum of four (4) feet, measured from the exterior edge of the pad or vault, and a maximum slope of 2:1 beginning from that four (4) foot distance from the exterior edge of the pad or vault. For both temporary and final grade situations, a level

area extending ten (10) feet out from the edge of the concrete pad in front of equipment doors or access panels is necessary. Refer to Drawing No. F-062388 attached.

If the slope cannot be maintained at the grades specified above, additional protection such as barriers or piling is required. All shoring and excavation (closer than the above limits) shall be done by a qualified person(s) under the employ of a qualified electrical contractor.

2. Concrete-Encased Duct

Excavation wider than five (5) feet under a concrete-encased duct requires a method designed and certified by an Alaska-registered civil engineer and approved by Chugach. Installation of the temporary shoring or bracing shall be done under the supervision of a qualified person under the employ of a qualified electrical contractor.

D. POLE/GUY ANCHOR EXCAVATION

Excavation beginning no closer than a three (3) foot radius from a pole or guy anchor in stable soil conditions or a ten (10) foot radius from a pole or guy anchor in organic/unstable soil conditions is allowed, provided the slope from that point does not exceed 1:1. Refer to Drawing No. F-062388 attached.

Excavation closer than the limits defined above or within a ten (10) foot radius of more than one consecutive pole where excavation will be open while more than one pole is affected, may require shoring of each pole. Chugach review and approval of a shoring plan is required for all excavations where more than one pole is subject to an open excavation. Pole shoring shall be approved by Chugach for the specific excavation. All work for installing poles must be performed within OSHA guidelines. Shoring by other methods requires prior approval by Chugach on a case-by-case basis. Streetlight poles may be temporarily removed, subject to a written agreement with Chugach, prior to excavation.

Any excavation that may expose the pole butt requires a structural analysis of the pole shoring method. The analysis shall be performed by an Alaska-licensed professional engineer familiar with electrical transmission and distribution design standards in use by Chugach. Chugach also reserves the right, at contractor expense, to have a structural engineer examine any excavation deeper than the pole butt within a fifteen (15) foot radius of the pole.

All shoring and excavation (closer than the above limits) shall be done by a qualified person under the employ of a qualified electrical contractor.

E. RELOCATION REQUIRED

Where protection of the cable and structures cannot be maintained, as required in Sections A, B, and C, relocation of those facilities will be required prior to the intended work and at the contracting agency's expense.

F. BACKFILL

Replacement backfill for electrical facilities must be in accordance with Chugach specifications and performed by a qualified person under the employ of a qualified electrical contractor.

A damaged underground facility may not be reburied until it is repaired or relocated to the satisfaction of Chugach.

G. INSPECTION AND APPROVAL

All work on or in the immediate vicinity of Chugach facilities, such as backfilling, temporary support, shoring, and relocations are subject to prior approval and inspection by Chugach. On large projects where inspection time is substantial, all costs for inspection shall be the responsibility of the agency or entity contracting for the work. Reimbursement to Chugach shall be in accordance with Chugach's tariff, Section 8.

For any questions or approvals involving these requirements contact Chugach Line Operations at (907) 762-7679 and your call will be directed to the appropriate department for assistance.

H. MISCELLANEOUS

1. Depending on the soil type, depth and length of the excavation, type of Chugach facility involved, and the certainty of the cable locate markings, excavations can be approved within a two (2) foot radius of cable on a case-by-case basis.

2. Stable soil conditions are defined as all dry and non-organic. Soil conditions shall be evaluated and approved on a case-by-case basis by Chugach. The evaluation will be done using 29CFR1926, Subpart P, "*Excavations*" as a guide.

3. Excavation, except as noted, shall be defined as mechanically performed by a backhoe, trencher, scraper, grader, auger, or other equipment.

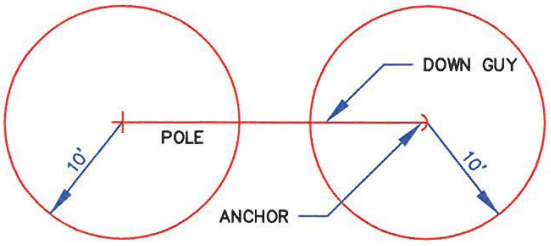
4. Cables are defined as insulated conductors whether buried directly or in conduit. The guidelines for cables also include 600-Volt pedestals and other small electrical apparatus associated with cables but not included under pads or vaults.

5. Spare conduit is not included in these provisions except to the extent of providing temporary support when exposed and inspected by Chugach prior to the placement of proper backfill.

6. Chugach defines a *qualified electrical contractor* as a contractor registered in the State of Alaska who has an Electrical Administrator's License in the Outside Linework category; or who has an employee with an Electrical Administrator's License in the same category registered with the contractor.

7. Chugach defines a *qualified person* as a journeyman lineman who holds a current Certificate of Fitness in the Journeyman Lineman category issued by the State of Alaska.

8. Chugach defines *hand-digging* as the removal of soil with hand tools, an air-knife tool (compressed air jet), or a vacuum truck.

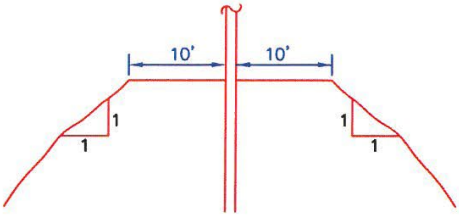


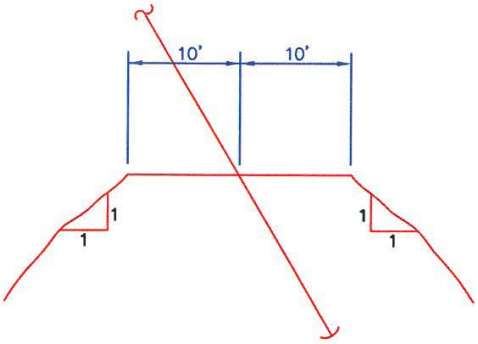
PLAN

(RADIUS OF UNDISTURBED SOIL)

NOTE:

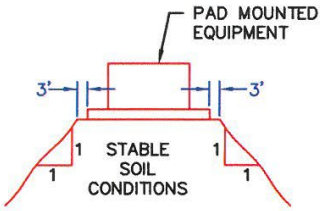
FOR VERY UNSTABLE SOIL CONTACT CHUGACH ELECTRIC.





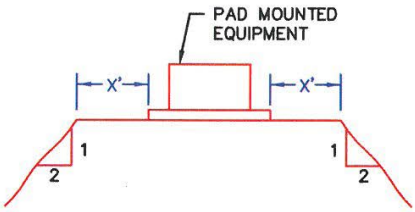
PROFILE

POLES/GUYS



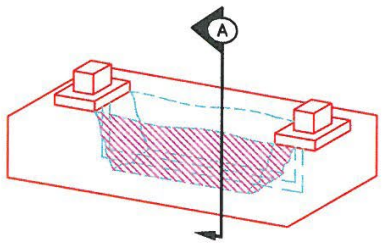
DURING CONSTRUCTION

SUPPLEMENTAL SUPPORT REQUIRED FOR EXCAVATIONS WITHIN 5' OF PADMOUNTED EQUIPMENT LOCATED ON UNSTABLE SOIL CONTACT CHUGACH ELECTRIC

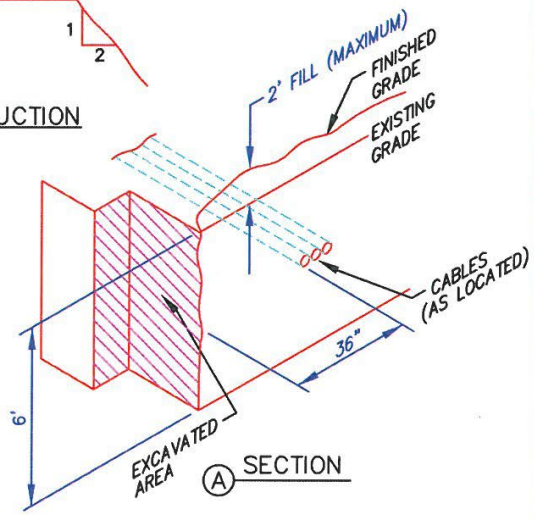


AFTER CONSTRUCTION

X': 10' ON DOOR/ACCESS SIDES. 4' ON OTHER SIDES.



PARALLEL EXCAVATION



A SECTION

STRUCTURES/CABLES

REV. NO.: 3 DATE: 1/28/98

Standards Engineer:

Mgr., Dist. Engineering:

Mgr., Const. & Maint.:

Dir., T&D Services Div.:

Chugach Electric Association, Inc.

EXCAVATION LIMITS

DEFINITION OF LIMITS REQUIRING NO ADDITIONAL STRUCTURAL SUPPORT

DRAWING NUMBER F-062388

SHEET 1 OF 1

Sec. 42.30.450. Waiver of requirements by written agreement.

An operator and an excavator may, by written agreement, waive the requirements of AS 42.30.400 - 42.30.490 that the excavator notify the operator of planned excavations and that the operator locate underground facilities. The agreement must identify the geographic areas to which the waiver applies and the time period for which the waiver is valid.

Sec. 42.30.460. Underground facility owner.

If the operator of an underground facility is not the owner of the facility and if the operator cannot be identified or has been identified but cannot be reached in a reasonable amount of time, the excavator may give the notice required by AS 42.30.400 - 42.30.490 to the owner of the underground facility and the owner shall assume the duties and responsibilities of the operator under AS 42.30.400 - 42.30.490.

Sec. 42.30.490. Definitions.

(1) "damage" means

(A) the substantial weakening of structural or lateral support of an underground facility;

(B) penetration, impairment, or destruction of any underground protective coating, housing, or other protective device; and

(C) the partial or complete severance of an underground facility to the extent that the project owner or facility operator determines that repairs are required;

(2) "emergency" means

(A) a condition that constitutes a clear and present danger to life, health, or property; or

(B) an unplanned service interruption;

(3) "excavation" means

(A) an activity in which earth, rock, or other material on or below the ground is moved or otherwise displaced by any means;

(B) road maintenance that changes the original road grade;

(C) demolition or movement of earth by equipment, tools, or explosive device except tilling of the soil less than 12 inches in depth for agricultural purposes;

(4) "excavator" means a person who conducts excavation in the state;

(5) "inaccessible" means impossible or unreasonably difficult to reach due to conditions beyond the control of the underground facility operator;

(6) "notification center" or "center" means a service through which a person is able to call one number to notify member operators of underground facilities that an excavation is proposed and to request the operators to mark facilities located inside of the proposed excavation area;

(7) "operator" means a person who supplies a service for commercial or public use by means of an underground facility;

(8) "person" means any individual, public or private corporation, political subdivision, government agency, municipality, industry, partnership, copartnership, association, firm, trust, estate, or any other entity whatsoever;

(9) "remote" means not accessible by road;

(10) "underground facility" means a pipe, sewer, conduit, cable, valve, line, or wire, including attachments and those parts of poles or anchors that are below ground, for use in connection with the storage or conveyance of water, sewage, telecommunications, cable television, electricity, petroleum, petroleum products, hazardous liquids, or flammable, toxic, or corrosive gas;

(11) "unstaffed" means not normally staffed with employees;

(12) "working day" means a day on which an underground facility operator is open for regular business.

ALASKA STATUTES

TITLE 42

PUBLIC UTILITIES & CARRIERS

Sec. 42.30.400. Excavator's notice of proposed excavation.

(a) Before beginning an excavation, an excavator shall give notice of the proposed excavation to each underground facility operator who has an underground facility in the area of the proposed excavation and request the operator to field mark the location of its underground facility. The excavator shall notify an underground facility operator who subscribes to a notification center by giving notice to the center. The excavator shall notify an underground facility operator listed in the applicable telephone directory who is not a subscriber to a notification center by giving notice directly to the operator.

(b) Except in the case of an emergency locate request or a request to locate in a remote, unstaffed, or inaccessible location, the excavator shall notify an underground facility operator who may have a facility in the area of a proposed excavation at least two but not more than 15 working days before the date scheduled for beginning the excavation. In the case of a request to locate in a remote or unstaffed location, the excavator shall notify the operator at least 10 but not more than 20 working days before the scheduled date for beginning excavation.

(c) In an emergency, the excavator shall immediately notify each underground facility operator in the area of the emergency and of the need for the excavation and request prompt location of underground facilities.

Sec. 42.30.410. Operator's response to request to locate; immunity related to unmarked or inaccurately marked facilities.

(a) An underground facility operator shall accept requests to locate underground facilities during the operator's regular business hours. An operator who receives a request to locate shall maintain for at least one year an accurate record of the request and responses to the request.

(b) When an underground facility operator receives a request to locate, it shall notify the excavator of the location of the underground facilities that the operator is able to field mark with reasonable accuracy and field mark those facilities. If the operator owns, uses, or operates an underground facility that is identified as being in the area of the proposed excavation but that the operator cannot field mark with reasonable accuracy, the operator shall provide the excavator with the best information available to the operator about its location and shall provide on-site assistance until the facility is located or until the excavator no longer needs assistance in locating that facility.

(c) The field marks for an underground facility buried 10 feet deep or less must be located within 24 horizontal inches of the outside dimensions of the facility. For a facility buried deeper than 10 feet, the operator shall locate the field marks within 30 horizontal inches of the outside dimensions of the facility. The operator shall use stakes, paint, or other clearly identifiable material to show the field location of the underground facility. The marker used to designate the approximate location of an underground facility must follow the current color code standard used by the American Public Works Association.

(d) Except for an underground facility in a remote, unstaffed, or inaccessible location, an underground facility operator shall respond to a request to locate promptly. A response is considered to be prompt if it is made within two working days after the operator receives the request or at a later time so long as the response occurs before the beginning of the excavation. For an underground facility in an accessible remote or unstaffed location, the operator shall respond within 10 working days after the operator receives the request or at a later time so long as the response occurs before the beginning of excavation.

(e) After an operator has field marked an underground facility, the excavator is responsible for maintaining the markings.

(f) An excavator may not begin to excavate until each underground facility has been field marked.

(g) When an operator has field marked an underground facility once at the request of an excavator, the operator has the right to receive compensation from the excavator for costs incurred in responding to subsequent requests to locate the same underground facility during the same excavation project if the excavator failed to maintain the original marking.

(h) If an excavator discovers an underground facility that was not field marked or was inaccurately field marked, the excavator shall immediately stop excavating in the vicinity of the facility and shall notify the operator of the discovery. The excavator may notify the operator by means of a notification center. The operator shall treat the notification as a request to locate in an emergency and shall respond accordingly. An excavator may not be held liable for inadvertent damage caused to an unmarked or an inaccurately marked underground facility.

(i) Unless the request to locate is made in response to an emergency, an underground facility operator has the right to receive compensation for costs incurred in responding to a request to locate that gives the operator less notice than the minimum notice required by this section. This subsection may not be interpreted to require the operator to respond to the request to locate within the time requested in the notice.

Sec. 42.30.420. Responsibility of construction project owners.

The owner of a construction project that will require excavation shall indicate in bid documents or contracts for construction the existence of underground facilities that the project owner knows are located inside of the proposed area of excavation. This requirement does not release the excavator from the excavator's responsibility under AS 42.30.400 - 42.30.490.

Sec. 42.30.430. Obligations concerning the conduct of excavations.

(a) An excavator shall use reasonable care to avoid damaging an underground facility. The excavator shall

(1) determine, without damage to the facility, the precise location of an underground facility whose location has been marked;

(2) plan the excavation to avoid damage to and minimize interference with an underground facility in or near the excavation area; and

(3) to the extent necessary to protect a facility from damage, provide support for an underground facility in and near the construction area during the excavation.

(b) An excavator who, in the course of excavation, contacts or damages an underground facility shall notify the operator. If the damage causes an emergency, the excavator shall also alert appropriate local public safety agencies and take reasonable steps to ensure public safety. A damaged underground facility may not be reburied until it is repaired or relocated to the satisfaction of the operator. The operator of an underground facility that was damaged during excavation shall arrange for repair or relocation of the facility as soon as practical.

Sec. 42.30.440. Penalties; injunctive relief.

(a) In addition to all other remedies provided by law, a person who violates a provision of AS 42.30.400 - 42.30.490 is subject to a civil penalty of not less than $50 nor more than $1,000 for each offense if the violation results in or significantly contributes to damage to an underground facility.

(b) If the court finds that an excavator is violating or threatening to violate a provision of AS 42.30.400 - 42.30.490 and the violation may result in damage to an underground facility, the court may grant injunctive relief to the underground facility operator.

Excavation Safety for Natural Gas Pipelines

Safety



ENSTAR Natural Gas Company provides natural gas service through 3,580 miles of gas mains to over 142,000 customers in South Central Alaska. ENSTAR's gas pipeline system is designed, installed, and maintained with the highest regard for safety in compliance with applicable federal, state, and local government statutes and regulations. ENSTAR is regularly inspected to ensure that its operation meets industry standards.

The US Department of Transportation, Pipeline & Hazardous Materials Safety Administration (PHMSA) oversees minimum safety regulations for the transportation of natural gas by pipelines. The DOT safety regulations are currently published in Title 49, Part 190, 191, 192 & 199 of the Code of Federal Regulations (CFR).

The Law

Call 811 before you dig; it's free and it's the law. Calling for locates is now as simple as dialing **811** or go online to www.akonecall.com. In Alaska, dialing **811** connects you with Alaska Digline Inc. Alaska Digline Inc. will take your excavation information and notify all affected utilities. Utilities have two business days to mark their utilities after receiving your call.

PHMSA is the excavation damage enforcement agency in the State of Alaska. The enforcement program protects the public from the risk of pipeline ruptures caused by excavation damage. Should an excavator violate any of the damage prevention requirements prescribed in 49 CFR part 196, Subpart B, they may face civil and or criminal penalties. Civil penalties of not more than $200,000 for each violation, not to exceed $2,000,000 may be levied. Criminal penalties may be enforced with imprisonment of not more than 5 years per violation. More information about the PHMSA ruling can be found at http://www.phmsa.dot.gov/.

Excavation Safety for Natural Gas Pipelines

Pipeline Markers

Do not assume there is not a pipeline if there is no marker.

ENSTAR transmission pipelines are generally marked above ground with pipeline markers similar to the one shown. Transmission pipelines are located in the vicinity of the pipeline markers. Transmission pipelines are steel and range in size from 2" to 20" in diameter. They are typically coated with a protective coating. Pipeline coatings are predominantly yellow and black, but may also be green or brown.

Typical ENSTAR Pipeline Marker

Distribution pipelines are steel, or High Density polyethylene with locate wire. These pipelines range in size from 1" diameter to 12" in diameter. Gas "Mains" are typically found in street right-of-ways or utility easements and supply the natural gas to an entire street or subdivision.
Natural gas service lines are connected to the gas main. Service lines generally serve a single building or small group of buildings on private property. Service lines are typically ½" to 2" in diameter. Service lines can be rigid steel, steel tubing, copper or polyethylene with locate wire. Gas mains and service lines are generally black or yellow in color.

Steps to Follow

1 **Line Locating: A Free Service:** To request a locate, dial **811**, the Nationally recognized One-Call number and you will be connected to Alaska Digline Inc. Call at least 2 but not more than 15 working days before the date scheduled for beginning the excavation.

2 **Request a Relocate Ticket when**: the marks have not been maintained, the excavator is unable to accurately "read" the locate marks, the marks have been destroyed, or the marks are more than 15 working days old.

3 **Excavating around Locate Marks:** In Alaska, you must use reasonable care when digging within 24 horizontal inches of the outside dimensions of the locate marks. If you are digging to a depth of 10 feet or greater, you must use reasonable care within 30 horizontal inches. *Treat all buried lines as if they were active.*
Typical means of excavating around locate marks:

- Hand Dig
- Air Knife
- Vac Truck

4 **Standby/Inspection Requirements:** Extreme caution must be exercised whenever pipelines are encountered. All excavations in the immediate vicinity of ENSTAR Natural Gas facilities (including backfill, compaction, temporary support, and shoring), are subject to prior approval and inspection by ENSTAR personnel. Pipeline inspections are provided whenever an excavator is working within 10 feet of a transmission pipeline, or within 5 feet of a distribution line. If excavation occurs without either locates or standby (qualified ENSTAR personnel), ENSTAR Natural Gas reserves the right to excavate to determine if there has been any damage to ENSTAR Natural Gas facilities. If damage has occurred ENSTAR Natural Gas has the right to charge the excavator for repairs.

Excavation Safety for Natural Gas Pipelines

5 **Support for Steel Pipeline Crossings:** If an excavation below a **steel gas** pipeline leaves the pipeline unsupported for a distance of more than 20 feet, the excavator must provide additional support for the pipeline. Support must be provided in a way as to not damage the pipe or its coating during construction, backfill placement, and compaction. Generally, a support spacing of 5 feet or less will provide the required support. ENSTAR Engineering must approve all excavations crossing steel pipelines above 4-inch diameter. If support is required, ENSTAR engineering written approval is required prior to beginning construction. Call ENSTAR Engineering (907)334-7740 for further information. Extra care must be taken when geotextile fabric and/or rigid insulation are used. Geotextile fabric and/or rigid insulation shall be sufficiently separated from steel pipeline and in addition to continuous support under the pipeline, compacted fill material shall be placed between the geotextile fabric/rigid insulation and the pipeline (see item 10 clearance). Care shall be taken to insure stability for the ENSTAR facility. Failure to properly protect ENSTAR's facilities could result in future damage if differential settlement occurs.

6 **Support for Polyethylene Line Crossings:** If an excavation is below a **polyethylene gas pipeline** the excavator must continuously support such pipeline during construction, backfill placement, and compaction. Geotextile fabric and/or rigid insulation shall be sufficiently separated from the polyethylene gas pipeline to prevent undue stress during the compaction/settlement process. (see item 10 clearance)

7 **Excavation Parallel to Pipeline: Whenever an excavation (horizontal or vertical) is performed within 5 feet of a distribution pressure pipeline and 10 feet of a transmission pressure pipeline, the gas pipeline must be exposed to visually determine the exact location.** When parallel excavations are expected to expose or undermine sections of pipeline, the excavator must notify ENSTAR engineering in advance. Care must be taken not to damage the pipeline, or to induce stresses due to differential settlement following construction**. Long parallel excavations exposing pipelines can be very dangerous if not properly performed and shall not be attempted without prior approval by ENSTAR.** Unless otherwise approved by ENSTAR engineering, all excavations parallel to a gas pipeline require that the pipeline be exposed at intervals no greater than every 25 feet to visually determine the pipeline's exact location. Contact ENSTAR Engineering at (907)334-7740 for additional information.

8 **Blasting:** All plans for blasting that will occur within 500' of any Company Facility, shall be reviewed by an ENSTAR engineer. The person performing the blasting shall take all appropriate measures as recommended by ENSTAR engineering, (i.e. require minimum distance from facilities, minimize blasting charge intensity, etc.) to protect the integrity of the Company's Facilities. A leak survey shall be performed before and after any blasting activity, within 500' of any Company Facility.

9 **Trenchless Excavation (Vertical or Horizontal): Whenever a trenchless excavation (horizontal or vertical) is performed within 5 feet of a distribution pressure pipeline and 10 feet of a transmission pressure pipeline, the gas pipeline must be exposed to visually determine the exact location.** If the trenchless excavation is expected to cross the pipeline within the aforementioned distances, the pipeline in question shall be fully exposed to a minimum of 1 foot beneath the pipeline prior to the expected crossing to ensure that the pipeline is not unduly damaged due to ground movement in the immediate vicinity of the pipeline. **When performing a trenchless excavation parallel to a gas pipeline, the gas pipeline must be exposed at intervals of 25 feet or less to visually determine the pipeline's exact location.** Trenchless excavation is defined as drilling, directional drilling, boring, pile installation etc.

10 **Clearance:** Natural Gas pipelines require a **12 inch minimum separation from other underground structures** not associated with ENSTAR's pipeline system. Additional clearance from other underground structures may be required to allow proper maintenance and reduce the possibility of damage due to

Excavation Safety for Natural Gas Pipelines

the proximity of other structures (49 CFR § 192.325.) This clearance requirement includes rigid insulation and geotextile fabrics. **ENSTAR requires a 36-inch minimum separation from certain electrical facilities, including any grounded components i.e. ground rods, non-insulated conductors and associated structures.**

11 **Pipeline Cover:** ENSTAR pipelines in public rights-of-way are generally installed with 36 inches to 48 inches of cover, and in private rights-of-way with 12 inches to 36 inches of cover. Projects that decrease cover or increase cover in excess of 60 inches must receive prior approval from ENSTAR Engineering Department (907)334-7740**.** ENSTAR has limited ability to prevent the removal of cover over gas pipelines. Increasing pipeline cover more than 5 feet or decreasing pipeline cover to less than 3 feet may be considered a damage that may result in relocation of the gas pipeline at the expense of the Excavator. The depth of cover listed above cannot be assumed after installation. The excavator is responsible for any damage to ENSTAR pipelines regardless of the depth at which they are encountered.

12 **Landscaping:** Most landscaping activities require locates, and when it is determined that landscaping activities are within 5 feet of a distribution pipeline, or 10 feet of a transmission pipeline, Inspection/Standby requirements as listed above are applicable. Planting of trees and shrubs over existing pipelines is not permissible and can present a safety and reliability hazard to the pipeline.

Damage Reporting

If you damage a gas line, immediately Call 911 and ENSTAR at 1-844-SMELL GAS (1-844-763-5542). It's the Law.

Gas lines that have been pulled, stretched, kinked or bent could be damaged underground away from where the line is connected. If you pull or stretch gas lines call ENSTAR at (907)277-5551 and an ENSTAR Representative will investigate for possible underground leakage.

Pipe Wall Protection

Dents, scrapes, gouges and scratches reduce pipeline wall thickness and affect the safety of the facility in two ways. First, the reduced wall thickness decreases the pressure at which the pipeline can safely operate. Second, the damage serves as a stress concentration that can cause a future brittle failure of the pipeline. **An ENSTAR representative must inspect each dent, scrape, gouge or scratch, no matter how small, before it is reburied.**

Corrosion Protection

ENSTAR's **steel** pipelines are protected from corrosion by a dielectric coating and an impressed current or galvanic anode cathodic protection system. Direct contact with metallic objects (a short) or removal of the protective coating can compromise this system. Contact the ENSTAR Engineering Department (907)334-7740, whenever coating damage or a short is encountered. **An ENSTAR representative must inspect each short or section of damaged coating before it is reburied.**

Locate Wire Protection

ENSTAR's **polyethylene** pipelines are installed with a parallel copper wire, which is used to locate the pipeline. If the locate wire or wire coating is damaged, ENSTAR's ability to properly locate the pipeline may be severely compromised. Electrical continuity must be maintained. **An ENSTAR representative must**

Excavation Safety for Natural Gas Pipelines

inspect and/repair each possible locate wire damage before it is reburied, accidental locate wire damage repair is free of charge.

Excess Flow Valves

An Excess Flow Valve (EFV) is a safety device installed in a natural gas service line near the gas main that is designed to automatically shut off the flow of natural gas in the event that the service line is broken. Effective April 14th, 2017, all gas companies nationwide are required to install an EFV or a curb-side shut off valve in any new or renewed service lines.

What does this mean to you as an Excavator?
Should you damage a natural gas service line that has an EFV, the gas will blow for a short duration and shut off automatically if the flow of gas is sufficient to close the EFV. Damages that do not sever the service line completely may not cause the EFV to close and the gas will continue to blow. Regardless, **you must report all damages to ENSTAR immediately**. EFVs are designed to allow a small amount of "bleed-by" so they can be reset without excavating the gas main. Backfilling a damaged service line with gas bleeding underground is extremely dangerous and could fuel an explosion if it is not repaired timely. **Do not assume a damaged service is dead or abandoned if it is not blowing gas**. The EFV may have shut down the flow of gas. Report all damages immediately by calling **1-844-SMELL-GAS.**

Please remember that the vast majority of ENSTAR service lines WILL NOT have an EFV. Should you damage a service line without an EFV, gas will blow at full line pressure until ENSTAR can arrive to shut it off. Your best protection against damaging underground utilities is to call **811** for locates and hand dig within 2 feet of the locate marks.

What to do if You Smell Gas

Natural gas actually does not have a natural odor, but mercaptan compounds are added to distribution system gas to enable you to smell a leak. If you smell the characteristic Sulphur odor, call ENSTAR at 1-844-SMELL GAS (1-844-763-5542)

Qualified Personnel Requirements

Only qualified individuals meeting all applicable requirements may perform work on Natural Gas facilities. At a minimum, such individuals must comply with applicable federal, state and local regulation, statutes, and ordinances.

Additional pipeline information can be found on the following websites:

PHMSA/DOT	https://phmsa.dot.gov/pipeline
Common Ground Alliance	http://www.commongroundalliance.com
Pipeline 101	http://www.pipeline101.com
Alaska Digline, Inc.	http://www.akonecall.com/

Excavation Safety for Natural Gas Pipelines

For further information about ENSTAR, visit our web site @ www.enstarnaturalgas.com

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 SEWER IMPROVEMENTS

PUMP STATION 12 FORCE MAIN / INTERCEPTOR C GRAVITY JUNCTION REHABILITATION

SECTION VIII

MINIMUM RATES OF PAY

State of Alaska Wage Rate

Federal Wage Determination with Attachments

Laborers' & Mechanics' Minimum Rates of Pay

Title 36. Public Contracts AS 36.05 & AS 36.10 Wage & Hour Administration Pamphlet No. 600 (Pamphlet 600) is hereby incorporated in its entirety. Pamphlet 600 is available for free download at http://labor.state.ak.us/lss/pamp600.htm.

The Municipality of Anchorage will include a paper copy of the wage rates in the signed Contract.

"General Decision Number: AK20220001 07/08/2022

Superseded General Decision Number: AK20210001

State: Alaska

Construction Types: Building and Heavy

Counties: Alaska Statewide.

BUILDING AND HEAVY CONSTRUCTION PROJECTS (does not include residential construction consisting of single family homes and apartments up to and including 4 stories)

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 $15.00 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 2022.
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 $11.25 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 2022.

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 https://www.dol.gov/agencies/whd/government-contracts.

Modification Number	Publication Date
0	01/07/2022

1	02/18/2022
2	02/25/2022
3	03/11/2022
4	03/18/2022
5	04/15/2022
6	07/08/2022

ASBE0097-001 06/01/2021

	Rates	Fringes
Asbestos Workers/Insulator (includes application of all insulating materials protective coverings, coatings and finishings to all types of mechanical systems)	$ 38.68	21.57
HAZARDOUS MATERIAL HANDLER (includes preparation, wetting, stripping, removal scrapping, vacuming, bagging, and disposing of all insulation materials, whether they contain asbestos or not, from mechanical systems)	$ 37.38	19.55

BOIL0502-002 01/01/2021

	Rates	Fringes
BOILERMAKER	$ 47.03	30.59

BRAK0001-002 07/01/2020

	Rates	Fringes
Bricklayer, Blocklayer, Stonemason, Marble Mason, Tile Setter, Terrazzo Worker	$ 42.16	19.67
Tile & Terrazzo Finisher	$ 35.99	19.67

CARP1501-001 09/01/2019

	Rates	Fringes
MILLWRIGHT	$ 37.64	23.46

CARP2520-003 09/01/2019

	Rates	Fringes
Diver		
Stand-by	$ 42.65	26.51
Tender	$ 41.65	26.51
Working	$ 82.45	26.51
Piledriver		
Piledriver; Skiff Operator and Rigger	$ 38.34	26.51
Sheet Stabber	$ 38.34	26.51
Welder	$ 43.90	26.51

DEPTH PAY PREMIUM FOR DIVERS BELOW WATER SURFACE:

50-100 feet	$1.00 per foot
101 feet and deeper	$2.00 per foot

ENCLOSURE PAY PREMIUM WITH NO VERTICAL ASCENT:
5-50 FEET $1.00 PER FOOT/DAY
51-100 FEET $2.00 PER FOOT/DAY
101 FEET AND ABOVE $3.00 PER FOOT/DAY

SATURATION DIVING:
The standby rate applies until saturation starts. The saturation diving rate applies when divers are under pressure continuously until work task and decompression are complete. the diver rate shall be paid for all saturation hours.

WORK IN COMBINATION OF CLASSIFICATIONS:
Employees working in any combination of classifications within the diving crew (except dive supervisor) in a shift are paid in the classification with the highest rate for that shift.

CARP4059-001 09/01/2019

	Rates	Fringes
CARPENTER Including Lather and Drywall Hanging	$ 38.34	26.51

ELEC1547-004 04/01/2022

	Rates	Fringes
CABLE SPLICER	$ 42.77	3% + 27.97
ELECTRICIAN	$ 42.44	3% + 28.22

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* ELEC1547-005 04/01/2022

Line Construction

	Rates	Fringes
CABLE SPLICER	$ 62.29	3%+32.37
Linemen (Including Equipment Operators, Technician)	$ 61.29	3%+30.98
Powderman	$ 59.29	3%+32.37
TREE TRIMMER	$ 38.05	3%+27.01

ELEV0019-002 01/01/2022

	Rates	Fringes
ELEVATOR MECHANIC	$ 63.16	36.885+a+b

FOOTNOTE: a. Employer contributes 8% of the basic hourly rate for over 5 year's service and 6% of the basic hourly rate for 6 months to 5 years' of service as vacation paid credit. b. Eight paid holidays: New Year's Day; Memorial Day; Independence Day; Labor Day; Veteran's Day; Thanksgiving Day; Friday after Thanksgiving, and Christmas Day

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ENGI0302-002 01/01/2022

	Rates	Fringes

POWER EQUIPMENT OPERATOR

GROUP 1	$ 43.53	25.95
GROUP 1A	$ 45.29	25.95
GROUP 2	$ 42.76	25.95
GROUP 3	$ 42.76	25.95
GROUP 4	$ 35.83	25.95
TUNNEL WORK		
GROUP 1	$ 47.88	25.95
GROUP 1A	$ 49.82	25.95
GROUP 2	$ 47.04	25.95
GROUP 3	$ 46.24	25.95
GROUP 4	$ 39.41	25.95

POWER EQUIPMENT OPERATOR CLASSIFICATIONS

GROUP 1: Asphalt Roller: Breakdown, Intermediate, and Finish; Back Filler; Barrier Machine (Zipper); Beltcrete with power pack and similar conveyors; Bending Machine; Boat Coxwains; Bulldozers; Cableways, Highlines and Cablecars; Cleaning Machine; Coating Machine; Concrete Hydro Blaster; Cranes-45 tons and under or 150 foot boom and under (including jib and attachments): (a) Hydralifts or Transporters, all track or truck type,(b) Derricks; Crushers; Deck Winches-Double Drum; Ditching or Trenching Machine (16 inch or over); Drilling Machines, core, cable, rotary and exploration; Finishing Machine Operator, Concrete Paving, Laser Screed, Sidewalk, Curb and Gutter Machine; Helicopters; Hover Craft, Flex Craft, Loadmaster, Air Cushion, All Terrain Vehicle, Rollagon, Bargecable, Nodwell, and Snow Cat; Hydro Ax: Feller Buncher and similar; Loaders (2 1/2 yards through 5 yards, including all attachments): Forklifts with telescopic boom and swing attachment, Overhead and front end, 2 1/2 yards through 5 yards, Loaders with forks or pipe clamps; Loaders, elevating belt type, Euclid and similar types; Mechanics, Bodyman; Micro Tunneling Machine; Mixers: Mobile type w/hoist combination; Motor Patrol Grader; Mucking Machines: Mole, Tunnel Drill, Horizontal/Directional Drill Operator, and/or Shield; Operator on Dredges; Piledriver Engineers, L. B. Foster, Puller or similar Paving Breaker; Power Plant, Turbine Operator, 200 k.w. and over (power plants or combination of power units over 300 k.w.); Scrapers-through 40 yards; Service Oiler/Service Engineer; Sidebooms-under 45 tons; Shot Blast Machine; Shovels, Backhoes, Excavators with all attachments, and Gradealls (3 yards and under), Spreaders, Blaw Knox, Cedarapids, Barber Greene, Slurry Machine; Sub-grader (Gurries, Reclaimer, and similar types); Tack tractor; Truck mounted Concrete Pumps, Conveyor, Creter; Water Kote Machine; Unlicensed off road hauler

GROUP 1A: Camera/Tool/Video Operator (Slipline), Cranes-over 45 tons or 150 foot (including jib and attachments): (a) Clamshells and Draglines (over 3 yards), (b) Tower cranes; Licensed Water/Waste Water Treatment Operator; Loaders over 5 yds.; Certified Welder, Electrical Mechanic, Camp Maintenance Engineer, Mechanic (over 10,000 hours); Motor Patrol Grader, Dozer, Grade Tractor, Roto-mill/Profiler (finish: when finishing to final grade and/or to hubs, or for asphalt); Power Plants: 1000 k.w. and over; Quad; Screed; Shovels, Backhoes, Excavators with all attachments (over 3 yards), Sidebooms over 45 tons; Slip Form Paver, C.M.I. and similar types; Scrapers over 40 yards;

GROUP 2: Boiler-fireman; Cement Hog and Concrete Pump Operator; Conveyors (except as listed in group 1); Hoist on steel erection; Towermobiles and Air Tuggers; Horizontal/Directional Drill Locator;Licensed Grade Technician; Loaders, (i.e., Elevating Grader and Material Transfer Vehicle); Locomotives: rod and geared engines; Mixers; Screening, Washing Plant; Sideboom (cradling rock drill regardless of size); Skidder; Trencing Machine under 16 inches; Waste/ Waste Water Treatment Operator.

GROUP 3: ""A"" Frame Trucks, Deck Winches: single power drum; Bombardier (tack or tow rig); Boring Machine; Brooms-power; Bump Cutter; Compressor; Farm tractor; Forklift, industrial type; Gin Truck or Winch Truck with poles when used for hoisting; Grade Checker and Stake Hopper; Hoist, Air Tuggers, Elevators; Loaders: (a) Elevating-Athey, Barber Green and similar types (b) Forklifts or Lumber Carrier (on construction job site) (c) Forklifts with Tower (d) Overhead and Front-end, under 2 1/2 yds. Locomotives:Dinkey (air, steam, gas and electric) Speeders; Mechanics (light duty); Oil, Blower Distribution; Post Hole Diggers, mechanical; Pot Fireman (power agitated); Power Plant, Turbine Operator, under 200 k.w.; Pumps-water; Roller-other than Plantmix; Saws, concrete; Skid Steer with all attachments; Straightening Machine; Tow Tractor

GROUP 4: Rig Oiler/Crane Assistant Engineer;Parts and Equipment Coordinator; Swamper (on trenching machines or shovel type equipment); Spotter; Steam Cleaner; Drill Helper.

FOOTNOTE: Groups 1-4 receive 10% premium while performing tunnel or underground work. Rig Oiler/Crane Assistant Engineer shall be required on cranes over 85 tons or over 100 feet of boom.

IRON0751-003 07/01/2021

	Rates	Fringes
IRONWORKER		
BENDER OPERATOR	$ 40.82	34.99
BRIDGE, STRUCTURAL, ORNAMENTAL, REINFORCING		
MACHINERY MOVER, RIGGER, SHEETER, STAGE RIGGER		
BENDER OPERATOR	$ 40.82	34.99
BRIDGE, STRUCTURAL, ORNAMENTAL, REINFORCING MACHINERY MOVER, RIGGER, SHEETER, STAGE RIGGER,		
BENDER OPERATOR	$ 38.75	32.63
FENCE, BARRIER INSTALLER	$ 37.32	34.99
GUARDRAIL INSTALLERS	$ 38.32	34.99
GUARDRAIL LAYOUT MAN	$ 38.06	34.99
HELICOPTER, TOWER	$ 41.82	34.99

LABO0341-001 04/01/2021

	Rates	Fringes
LABORER (South of the 63rd Parallel & West of Longitude 138 Degrees)		
GROUP 1	$ 32.00	31.11
GROUP 2	$ 33.00	31.11
GROUP 3	$ 33.90	31.11
GROUP 3A	$ 37.18	31.11
GROUP 3B	$ 40.97	28.40
GROUP 4	$ 21.57	31.11
TUNNELS, SHAFTS, AND RAISES		
GROUP 1	$ 35.20	31.11
GROUP 2	$ 36.30	31.11
GROUP 3	$ 37.29	31.11
GROUP 3A	$ 40.90	31.11
GROUP 3B	$ 45.07	28.40

LABORERS CLASSIFICATIONS

GROUP 1: Asphalt Workers (shovelman, plant crew); Brush Cutters; Camp Maintenance Laborer; Carpenter Tenders; Choke Setters, Hook Tender, Rigger, Signalman; Concrete Laborer(curb and gutter, chute handler, grouting, curing, screeding); Crusher Plant Laborer; Demolition Laborer; Ditch Diggers; Dump Man; Environmental Laborer (asbestos (limited to nonmechanical systems), hazardous and toxic waste, oil spill); Fence Installer; Fire Watch Laborer; Flagman; Form Strippers; General Laborer; Guardrail Laborer, Bridge Rail Installers; Hydro-Seeder Nozzleman; Laborers (building); Landscape or Planter; Laying of Decorative Block (retaining walls, flowered decorative block 4 feet and below); Material Handlers; Pneumatic or Power Tools; Portable or Chemical Toilet Serviceman; Pump Man or Mixer Man; Railroad Track Laborer; Sandblast, Pot Tender; Saw Tenders; Scaffold Building and Erecting; Slurry Work; Stake Hopper; Steam Point or Water Jet Operator; Steam Cleaner Operator; Tank Cleaning; Utiliwalk, Utilidor Laborer and Conduit Installer; Watchman (construction projects); Window Cleaner

GROUP 2: Burning and Cutting Torch; Cement or Lime Dumper or Handler (sack or bulk); Choker Splicer; Chucktender (wagon, airtrack and hydraulic drills); Concrete Laborers (power buggy, concrete saws, pumpcrete nozzleman, vibratorman); Culvert Pipe Laborer; Cured in place Pipelayer; Environmental Laborer (marine work, oil spill skimmer operator, small boat operator); Foam Gun or Foam Machine Operator; Green Cutter (dam work); Gunnite Operator; Hod Carriers; Jackhammer or Pavement Breakers (more than 45 pounds);Laying of Decorative Block (retaining walls, flowered decorative block above 4 feet); Mason Tender and Mud Mixer (sewer work); Pilot Car; Plasterer, Bricklayer and Cement Finisher Tenders; Power Saw Operator; Railroad Switch Layout Laborer; Sandblaster; Sewer Caulkers; Sewer Plant Maintenance Man; Thermal Plastic Applicator; Timber Faller, chain saw operator, filer; Timberman

GROUP 3: Alarm Installer; Bit Grinder; Guardrail Machine Operator; High Rigger and tree topper; High Scaler; Multiplate; Slurry Seal Squeegee Man

GROUP 3A: Asphalt Raker, Asphalt Belly dump lay down; Drill Doctor (in the field); Drillers (including, but not limited to, wagon drills, air track drills; hydraulic drills); Powderman; Pioneer Drilling and Drilling Off Tugger (all type drills); Pipelayers

GROUP 3B: Grade checker (setting or transfering of grade marks, line and grade)

GROUP 4: Final Building Cleanup

TUNNELS, SHAFTS, AND RAISES CLASSIFICATIONS

GROUP 1: Brakeman; Muckers; Nippers; Topman and Bull Gang; Tunnel Track Laborer

GROUP 2: Burning and Cutting Torch; Concrete Laborers; Jackhammers; Nozzleman, Pumpcrete or Shotcrete.

GROUP 3: Miner; Retimberman

GROUP 3A: Asphalt Raker, Asphalt Belly dump lay down; Drill Doctor (in the field); Drillers (including, but not limited to, wagon drills, air track drills; hydraulic drills); Powderman; Pioneer Drilling and Drilling Off Tugger (all type drills); Pipelayers.

GROUP 3B: Grade checker (setting or transfering of grade marks, line and grade)

Tunnel shaft and raise rates only apply to workers regularly employed inside a tunnel portal or shaft collar.

LABO0942-001 04/01/2022

	Rates	Fringes
Laborers: North of the 63rd Parallel & East of Longitude 138 Degrees		
GROUP 1	$ 33.00	31.37
GROUP 2	$ 34.00	31.37
GROUP 3	$ 34.90	31.37
GROUP 3A	$ 38.18	31.37
GROUP 3B	$ 41.97	29.00
GROUP 4	$ 22.57	31.37
TUNNELS, SHAFTS, AND RAISES		
GROUP 1	$ 36.20	31.37
GROUP 2	$ 37.40	31.37
GROUP 3	$ 38.39	31.37
GROUP 3A	$ 42.00	31.37
GROUP 3B	$ 46.17	29.00

LABORERS CLASSIFICATIONS

GROUP 1: Asphalt Workers (shovelman, plant crew); Brush Cutters; Camp Maintenance Laborer; Carpenter Tenders; Choke Setters, Hook Tender, Rigger, Signalman; Concrete Laborer(curb and gutter, chute handler, grouting, curing, screeding); Crusher Plant Laborer; Demolition Laborer; Ditch Diggers; Dump Man; Environmental Laborer (asbestos (limited to nonmechanical systems), hazardous and toxic waste, oil spill); Fence Installer; Fire Watch Laborer; Flagman; Form Strippers; General Laborer; Guardrail

Laborer, Bridge Rail Installers; Hydro-Seeder Nozzleman; Laborers (building); Landscape or Planter; Laying of Decorative Block (retaining walls, flowered decorative block 4 feet and below); Material Handlers; Pneumatic or Power Tools; Portable or Chemical Toilet Serviceman; Pump Man or Mixer Man; Railroad Track Laborer; Sandblast, Pot Tender; Saw Tenders; Scaffold Building and Erecting; Slurry Work; Stake Hopper; Steam Point or Water Jet Operator; Steam Cleaner Operator; Tank Cleaning; Utiliwalk, Utilidor Laborer and Conduit Installer; Watchman (construction projects); Window Cleaner

GROUP 2: Burning and Cutting Torch; Cement or Lime Dumper or Handler (sack or bulk); Choker Splicer; Chucktender (wagon, airtrack and hydraulic drills); Concrete Laborers (power buggy, concrete saws, pumpcrete nozzleman, vibratorman); Culvert Pipe Laborer; Cured in place Pipelayer; Environmental Laborer (marine work, oil spill skimmer operator, small boat operator); Foam Gun or Foam Machine Operator; Green Cutter (dam work); Gunnite Operator; Hod Carriers; Jackhammer or Pavement Breakers (more than 45 pounds);Laying of Decorative Block (retaining walls, flowered decorative block above 4 feet); Mason Tender and Mud Mixer (sewer work); Pilot Car; Plasterer, Bricklayer and Cement Finisher Tenders; Power Saw Operator; Railroad Switch Layout Laborer; Sandblaster; Sewer Caulkers; Sewer Plant Maintenance Man; Thermal Plastic Applicator; Timber Faller, chain saw operator, filer; Timberman

GROUP 3: Alarm Installer; Bit Grinder; Guardrail Machine Operator; High Rigger and tree topper; High Scaler; Multiplate; Slurry Seal Squeegee Man

GROUP 3A: Asphalt Raker, Asphalt Belly dump lay down; Drill Doctor (in the field); Drillers (including, but not limited to, wagon drills, air track drills; hydraulic drills); Powderman; Pioneer Drilling and Drilling Off Tugger (all type drills); Pipelayers

GROUP 3B: Grade checker (setting or transfering of grade marks, line and grade)

GROUP 4: Final Building Cleanup

TUNNELS, SHAFTS, AND RAISES CLASSIFICATIONS

GROUP 1: Brakeman; Muckers; Nippers; Topman and Bull Gang; Tunnel Track Laborer

GROUP 2: Burning and Cutting Torch; Concrete Laborers; Jackhammers; Nozzleman, Pumpcrete or Shotcrete.

GROUP 3: Miner; Retimberman

GROUP 3A: Asphalt Raker, Asphalt Belly dump lay down; Drill Doctor (in the field); Drillers (including, but not limited to, wagon drills, air track drills; hydraulic drills); Powderman; Pioneer Drilling and Drilling Off Tugger (all type drills); Pipelayers.

GROUP 3B: Grade checker (setting or transfering of grade marks, line and grade)

Tunnel shaft and raise rates only apply to workers regularly employed inside a tunnel portal or shaft collar.

PAIN1959-001 12/01/2021

NORTH OF THE 63RD PARALLEL

	Rates	Fringes
PAINTER		
BRUSH/ROLLER PAINT OR WALL COVERER	$ 34.25	25.10
TAPING, TEXTURING, STRUCTURAL PAINTING, SANDBLASTING, POT TENDER, FINISH METAL, SPRAY, BUFFER OPERATOR, RADON MITIGATION, LEAD BASED PAINT ABATEMENT, HAZARDOUS MATERIAL HANDLER	$ 34.77	25.10

PAIN1959-002 12/01/2021

SOUTH OF THE 63RD PARALLEL

	Rates	Fringes
PAINTER		
General Painter	$ 32.64	25.95
Industrial Painter	$ 32.74	25.95
Taper / Paper & Vinyl Hanger	$ 32.64	25.95

PAIN1959-003 12/01/2021

NORTH OF THE 63RD PARALLEL

	Rates	Fringes
GLAZIER	$ 41.16	28.16

PAIN1959-004 07/01/2019

	Rates	Fringes
FLOOR LAYER: Carpet	$ 28.75	14.44

PAIN1959-006 12/01/2021

SOUTH OF THE 63RD PARALLEL

	Rates	Fringes
GLAZIER	$ 41.37	27.25

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* PLUM0262-002 07/01/2022

East of the 141st Meridian

	Rates	Fringes
Plumber; Steamfitter	$ 41.32	27.62

PLUM0367-002 07/01/2021

South of the 63rd Parallel

	Rates	Fringes
Plumber; Steamfitter	$ 41.00	27.95

PLUM0375-002 07/01/2021

North of the 63rd Parallel

	Rates	Fringes
Plumber; Steamfitter	$ 42.91	31.25

PLUM0669-002 04/01/2019

	Rates	Fringes
SPRINKLER FITTER	$ 47.25	26.49

ROOF0189-006 04/01/2021

	Rates	Fringes
ROOFER	$ 44.62	17.63

SHEE0023-003 07/01/2021

South of the 63rd Parallel

	Rates	Fringes
SHEET METAL WORKER	$ 43.75	27.92

SHEE0023-004 07/01/2021

North of the 63rd Parallel

	Rates	Fringes
SHEET METAL WORKER	$ 49.04	28.26

TEAM0959-003 04/01/2021

	Rates	Fringes
TRUCK DRIVER		
GROUP 1	$ 41.94	26.12
GROUP 1A	$ 43.21	26.12
GROUP 2	$ 40.68	26.12
GROUP 3	$ 39.86	26.12
GROUP 4	$ 39.28	26.12
GROUP 5	$ 38.52	26.12

GROUP 1: Semi with Double Box Mixer; Dump Trucks (including rockbuggy and trucks with pups) over 40 yards up to and including 60 yards; Deltas, Commanders, Rollogans and similar equipment when pulling sleds, trailers or similar equipment; Boat Coxswain; Lowboys including attached trailers and jeeps, up to and including 12 axles; Ready-mix over 12 yards up to and including 15 yards); Water Wagon (250 Bbls and above); Tireman, Heavy Duty/Fueler

GROUP 1A: Dump Trucks (including Rockbuggy and Trucks with pups) over 60 yards up to and including 100 yards; Jeeps (driver under load)

GROUP 2: Turn-O-Wagon or DW-10 not self-loading; All Deltas, Commanders, Rollogans, and similar equipment; Mechanics; Dump Trucks (including Rockbuggy and Trucks with pups) over 20 yards up to and including 40 yards; Lowboys including attached trailers and jeeps up to and including 8 axles; Super vac truck/cacasco truck/heat stress truck; Ready-mix over 7 yards up to and including 12 yards; Partsman; Stringing Truck

GROUP 3: Dump Trucks (including Rockbuggy and Trucks with pups) over 10 yards up to and including 20 yards; batch trucks 8 yards and up; Oil distributor drivers; Oil Distributor Drivers; Trucks/Jeeps (push or pull); Traffic Control Technician

GROUP 4: Buggymobile; Semi or Truck and trailer; Dumpster; Tireman (light duty); Dump Trucks (including Rockbuggy and Truck with pups) up to and including 10 yards; Track Truck Equipment; Grease Truck; Flat Beds, dual rear axle; Hyster Operators (handling bulk aggregate); Lumber Carrier; Water Wagon, semi; Water Truck, dual axle; Gin Pole Truck, Winch Truck, Wrecker, Truck Mounted ""A"" Frame manufactured rating over 5 tons; Bull Lifts and Fork Lifts with Power Boom and Swing attachments, over 5 tons; Front End Loader with Forks; Bus Operator over 30 passengers; All Terrain Vehicles; Boom Truck/Knuckle Truck over 5 tons; Foam Distributor Truck/dual axle; Hydro-seeders, dual axle; Vacuum Trucks, Truck Vacuum Sweepers; Loadmaster (air and water); Air Cushion or similar type vehicle; Fire Truck/Ambulance Driver; Combination Truck-fuel and grease; Compactor (when pulled by rubber tired equipment); Rigger (air/water/oilfield); Ready Mix, up to and including 7 yards;

GROUP 5: Gravel Spreader Box Operator on Truck; Flat Beds, single rear axle; Boom Truck/Knuckle Truck up to and including 5 tons; Pickups (Pilot Cars and all light duty vehicles); Water Wagon (Below 250 Bbls); Gin Pole Truck, Winch Truck, Wrecker, Truck Mounted ""A"" Frame, manufactured rating 5 tons and under; Bull Lifts and Fork Lifts (fork lifts with power broom and swing attachments up to and including 5 tons); Buffer Truck; Tack Truck; Farm type Rubber Tired Tractor (when material handling or pulling wagons on a construction project); Foam Distributor, single axle; Hydro-Seeders, single axle; Team Drivers (horses, mules and similar equipment); Fuel Handler (station/bulk attendant); Batch Truck, up to and including 7 yards; Gear/Supply Truck; Bus Operator, Up to 30 Passengers; Rigger/Swamper

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WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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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.

==========

END OF GENERAL DECISIO"

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 SEWER IMPROVEMENTS

PUMP STATION 12 FORCE MAIN / INTERCEPTOR C GRAVITY JUNCTION REHABILITATION

SECTION IX

AWWU DISADVANTAGED BUSINESS ENTERPRISE PROGRAM (MBE/WBE)

ANCHORAGE WATER & WASTEWATER UTILITY (AWWU)

Disadvantaged Business Enterprise Program
Specifications for Utility Contracts

This project is funded in part with financial assistance from the Alaska Department of Environmental Conservation (ADEC) Alaska Clean Water Fund (ACWF) or Alaska Drinking Water Fund (ADWF) revolving loan and is required to comply with EPA regulations (40 CFR Part 33) concerning the use of the Disadvantaged Business Enterprise Program, Anchorage Municipal Charter, Code and Regulations (AMC) Chapter 7.60 Disadvantaged and Woman-Owned Business Enterprises, and to any other applicable federal and state regulations. Bidders shall be fully informed regarding the requirements of the above regulations and code.

A bidder who is not in compliance with the requirements of the applicable regulations and code, or these specifications will not be awarded this contract. Noncompliance after award of the contract constitutes a breach of the contract and may result in termination of the contract or other appropriate remedy for such breach.

Part I: Disadvantaged Business Enterprise Program Goals and Six Good Faith Efforts

All bidders shall solicit subcontractor or supplier bids prior to bid opening for this project. The bidder acknowledges that post-bid opening solicitations do not qualify for meeting Fair Share objectives or the Six Good Faith Efforts.

A. The Fair Share (or utilization goal) objective for minority (MBE) and women's (WBE) business enterprises participation for this project have been established as a percentage of the dollar amount awarded to the successful bidder for the project are as follows:

Construction 3.26% MBE 1.48% WBE

B. In addition to the percentage goals above, all bidders on this project **shall** carry out the required Six Good Faith Efforts listed below:

1. Include qualified small, minority and women's business enterprises on solicitation lists.
2. Assure that small, minority and women's businesses are solicited. If the MBE/WBE is only certified as a Disadvantaged Business Enterprise (DBE), such as through the Alaska Department of Transportation, and the bidder has exhausted all efforts to determine the subcontractor MBE/WBE status, the bidder may document either category of certification to meet the goal objectives.
3. Divide total requirements when economically feasible, into small tasks or quantities to permit maximum participation of small, minority and women's businesses.
4. Establish delivery schedules, where requirements of the work permit, which will encourage participation by small, minority and women's businesses.
5. Use the services and assistance of the U.S. Small Business Administration and the Minority Business Development Agency of the U.S. Department of Commerce, as appropriate.
6. If the prime contractor awards subcontracts, require the subcontractor to take the affirmative steps 1 through 5 above.

C. The Anchorage Water & Wastewater Utility will presume a lack of good faith effort to satisfy MBE and WBE goals if the bidder rejects bids from MBEs and/or WBEs which are as low, or

lower, than other competitors' bids. The bidder that rejects an as-low or lower bid from a MBE or WBE may submit proof to rebut this presumption.

D. If prime contractor is a MBE or WBE, such prime also must carry out the Six Good Faith Efforts to awards any subcontracts on this project to meet the goals.

E. Record keeping requirements. The prime contractor must retain all records documenting their Six Good Faith Efforts for audit purposes, and provide copies of these to the AWWU DBE Officer upon request.

Apparent successful bidders, who fail to meet the MBE and WBE goals, or fail to demonstrate completion of the required Six Good Faith Efforts, will not be awarded this contract.

Part II: Certified Minority (MBE) and Women's (WBE) Business Enterprises

A. A MBE/WBE, or a joint-venture with a MBE/WBE, must be currently certified prior to opening of bids in order for credit to be counted

B. Businesses must be certified by EPA, Small Business Administration (SBA), Department of Transportation (DOT), or by state, local, Tribal or private entities whose certification criteria match EPA's and who present proof of this will be eligible for credit. Proof may be in the form of a letter from the certifying agency or a current listing in a directory maintained by the certifying agency. MBE's and WBE's can no longer self-certify.

C. Those companies certified as DBEs by one of the agencies listed in Part II.B:

1. Whose majority ownership and control is vested in one or more minority individuals may be counted toward the MBE goal;
2. Whose majority ownership and control is vested in one or more non-minority women may be counted toward the WBE goal;
3. Whose majority ownership and control is vested in one or more minority individuals, and who are women may be counted toward either the MBE goal or the WBE goal, but not to both. The bidder may choose the goal for which these companies will count.

Part III: Credit for MBE and WBE Participation Toward Goals

The total dollar value of the contract awarded to certified MBEs or WBEs will count toward the goal on the project. The total dollar value of a contract with a company certified both as MBE and WBE is counted toward either the MBE or WBE goal, but not to both. The bidder may choose the goal to which the contract value is applied.

The MBE or WBE must perform work on the project in the category/categories of work for which certification is issued. While the MBE or WBE may perform work in other categories for which certification is not issued, only that work performed in the certified categories will be credited toward the goal for the project.

A. The MBE or WBE must perform a useful business function according to custom and practice in the industry; i.e., must be responsible for the execution of a distinct element of work and must carry out its responsibilities by actually performing, managing, and supervising the work, in order for the work to be credited toward the goal.

B. A MBE or WBE that acts merely as a broker or passive conduit of funds, without performing, managing, or supervising the work of its contract or subcontract in a manner consistent with normal business practices will not be credited toward the goal

1. Presumption. If 50% or more of the total dollar amount of a MBE or WBE's prime contract is subcontracted to a non-DBE, the MBE or WBE prime contractor will be presumed to be a broker, and no MBE or WBE participation may be reported.
2. Rebuttal. The MBE or WBE prime contractor may rebut this presumption by demonstrating that its actions are consistent with normal practices for prime contractors in its business and that it will actively perform, manage and supervise the work under this contract.

C. MBE or WBE trucker/hauler expenditures will be credited towards the goal only if the trucker/hauler is performing a commercially useful function. The following factors should be used in determining whether a MBE or WBE trucker/hauler is performing a commercially useful function:

1. The MBE or WBE must be responsible for the management and supervision of the entire trucking/hauling operation for which it is responsible on a particular contract, and there cannot be a contrived arrangement for the purpose of meeting MBE or WBE objectives.
2. The MBE or WBE must itself own and operate at least one fully licensed, insured, and operational truck used on the contract.

D. For joint ventures, MBE and WBE participation consists of the portion of the dollar amount of the joint venture attributable to the MBE or WBE. However, where the MBE/WBE's risk of loss, control or management responsibilities are not commensurate with the share of profit, the AWWU DBE Officer may direct an adjustment in the percentage counted toward the goal.

Part IV: Submission of Minority and Women's Business Enterprises Information

A. **TO BE SUBMITTED AS PART OF BID:**

The bidder for this project shall submit their **Contact Documentation or Subcontractor Information** (Attachment A or similar), a completed and signed **ADEC DBE Compliance Statement** - Disadvantage Business Enterprises (Minority and Women-Owned Business Enterprises) Compliance Statement (Attachment B), and a completed **AWWU Form 6100-3** – DBE Subcontractor Performance Form (Attachment C) for each proposed DBE subcontractor for which they intend to use toward meeting MBE/WBE utilization goals. If the bidder does not intend to utilize MBE or WBE subcontractors, AWWU Form 6100-3 must still be signed by bidder, and indicate "NONE TO BE USED" under "PRICE OF WORK SUBMITTED TO PRIME CONTRACTOR." The bidder shall then be required to show that the mandatory Six Good Faith Efforts, as set forth in these specifications contained elsewhere herein, have been met.

Bids without Contact Documentation or Subcontractor Information, completed and signed ADEC DBE Compliance Statement, and completed and signed AWWU Form 6100-3 form(s) will be considered non-responsive.

B. **TO BE SUBMITTED WITHIN FIVE (5) WORKING DAYS OF NOTICE FROM THE MUNICIPALITY OF ANCHORAGE (MOA) PURCHASING OFFICER:**

The successful bidder shall submit to the MOA Purchasing Officer a fully completed and signed **AWWU Form 6100-4** – DBE Subcontractor/Prime Utilization Form within five (5) working days of notice from the MOA Purchasing Officer. If prime contractor is a MBE or WBE, they must identify themselves on the AWWU Form 6100-4 as well. Additionally, if the bidder does not intend to utilize MBE or WBE subcontractors, AWWU Form 6100-4 must still be signed by bidder, and indicate "NONE TO BE USED". AWWU Form 6100-4 is included as Appendix D.

Upon review/verification of the submitted AWWU Form 6100-4, where the bidder is unsuccessful at meeting the MBE and/or WBE goals, the bidder will receive notice from the AWWU DBE Officer that goals have not been met. The bidder shall submit to the AWWU DBE Officer within five (5) working days all supporting documentation demonstrating the Six Good Faith Efforts were carried out to obtain MBE and/or WBE participation for whichever goal(s) that was not met. This documentation shall include all additional explanations the bidder may wish to supply in conjunction with his or her showing of good faith efforts to meet the goals. Information not brought to the attention of the AWWU DBE Officer by the bidder will not be considered in any appeal thereafter.

A contract may not be awarded to a bidder who fails to file the AWWU Form 6100-4 within the time specified. There shall be no substitutions, deletions, additions, or modifications to this listing subsequent to its submittal to Purchasing.

C. **TO BE SUBMITTED FOR EACH DBE SUBCONTRACTOR/PRIME EVERY 30 DAYS OR WITH REQUESTS FOR PROGRESS PAYMENTS, WHICHEVER IS SOONER, AND WITH FINAL REQUEST FOR PAYMENT:**

Each prime contractor shall file a completed **AWWU Form 6100-2** from each DBE subcontractor every 30 days, and with the final request for payment. If prime contractor is a MBE or WBE, they must complete an AWWU Form 6100-2 for themselves as well. This form shall be filled out completely and shall be submitted to the AWWU Project Manager. This form is included as Appendix E.

Part V: MBE/WBE Utilization Removal/Substitution

If a successful bidder for a contract which contains MBE and/or WBE participation goals, at any time after award of contract, proposes to remove or make substitutions for MBE and/or WBE subcontractors or joint-venture partners under the contract, a written notice of such removal or substitution shall be submitted to the AWWU DBE Officer prior to commencement of performance of the affected work, with the names, addresses and phone numbers of the subcontractors or joint venture partners to be removed or substituted for and an explanation of the reasons for the removal and substitution. The successful bidder shall make good faith efforts as defined in Part I.B to utilize another MBE or WBE subcontractor as the replacement. These efforts shall be documented and the circumstances fully explained in writing, and approval obtained from the AWWU DBE Officer prior to such replacement. The AWWU DBE Officer shall, within seven (7) days of receipt of such notice, approve said notice or removal and substitution where it is shown that the requested action is for good cause and not for discriminatory purposes.

Part VI: Other Provisions

The AWWU DBE Officer or his or her designee may visit the job site during regular working hours and interview subcontractors and employees for verification of compliance with these specifications and/or the regulations.

Part VII: Definitions

A. *Disadvantaged Business Enterprises (DBE)* - Per EPA requirements for projects funded under the Alaska Drinking Water Fund and Alaska Clean Water Fund loan programs, DBE only include entities owned and/or controlled by socially and economically disadvantaged individuals (as described in 4242 USC 7601 and 42 USC 4370d) – which includes Women's Business Enterprises (WBE) and Minority Business Enterprises (MBE). Small businesses must fall in a WBE or MBE category to qualify.

B. *Minority Business Enterprise (MBE) or Women Owned Business Enterprise (WBE*) - means a business concern which is owned and controlled by one or more minorities or women. Owned and controlled means a business:

1. Which is at least 51 percent owned by one or more minorities or women, or in the case of a publicly owned business, at least 51% of the stock is owned by one or more minorities or women;
2. Whose management and daily business operations are controlled by one or more such individuals.

C. *Minority Individual* - means an individual who is a citizen or lawful permanent resident of the United States and who is:

- Black;
- Hispanic;
- Portuguese;
- Asian American;
- American Indian and Alaskan Native, and
- Members of other groups, or other individuals, found to be economically and socially disadvantaged by the United States Small Business Administration under section 8(1) of the federal Small Business Act.

D. *Joint Venture* – a commercial enterprise undertaken by more than one business enterprise jointly, limited in its scope and duration to one project, for the purpose of each enterprise's profiting thereby.

E. Fair Share - is a reasonable amount of funds commensurate with the total project funding, demographic factors and the availability of minority and women's businesses. A fair share does not constitute an absolute goal, but a commitment on the part of the bidder to attempt to use minority and women's businesses by carrying out the "Good Faith Efforts".

For more information about these specifications, please contact the AWWU DBE Officer at the Anchorage Water & Wastewater Utility, 3000 Arctic Boulevard, Anchorage, AK 99503; telephone (907) 786-5589.

For information regarding the current State of Alaska Unified Certification Program Directory, contact the State of Alaska, DOT&PF in Anchorage, Alaska at (907) 269-0853.

Appendix A

EXAMPLE

Minority and Women-Owned Business Enterprises
Contact Documentation

Project Name____ ITB No.________________

Company Name ____

This form is provided for your convenience to document your efforts to meet DBE (MBE/WBE) utilization goals on this project. You may use additional sheets if needed. If you do not meet the MBE/WBE goal, you may return this form or other supporting documentation such as explanations, advertising notices, solicitations, telephone logs, etc. with your AWWU Form 6100-4.

Firm: ______________________________________ MBE ☐ WBE ☐

Address: ______________________________ Phone No: ________________

____

Type of Work: ______________________________ Amount $ __________

Dates of Contact: ________ ________ ________ ________ ________

Method of Contact: ____

Name of Person Contacted: ____

Results of Contact: ____

If rejected, why: ____

Firm: ______________________________________ MBE ☐ WBE ☐

Address: ______________________________ Phone No: ________________

____

Type of Work: ______________________________ Amount $ __________

Dates of Contact: ________ ________ ________ ________ ________

Method of Contact: ____

Name of Person Contacted: ____

Results of Contact: ____

If rejected, why: ____

Firm: ______________________________________ MBE ☐ WBE ☐

Address: ______________________________ Phone No: ________________

____

Type of Work: ______________________________ Amount $ __________

Dates of Contact: ________ ________ ________ ________ ________

Method of Contact: ____

Name of Person Contacted: ____

Results of Contact: ____

If rejected, why: ____

Appendix B **TO BE SUBMITTED AS PART OF BID**

STATE OF ALASKA
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

DISADVANTAGE BUSINESS ENTERPRISES
(MINORITY AND WOMEN-OWNED BUSINESS ENTERPRISES)
COMPLIANCE STATEMENT

To be eligible for award of this contract, the bidder must execute and submit, as part of his or her bid proposal, this statement relating to Disadvantage Business Enterprises (Minority and Woman-Owned Business Enterprises). This statement shall be deemed a material factor in the City's evaluation of this bid proposal. Failure to complete and submit this statement, or the inclusion of a false statement, shall render the bid proposal non-responsive.

The _____ (Company Name) acknowledges that Minority/Woman-Owned Business Enterprises (MBE/WBE) goals as indicated below have been established for this contract, and hereby assures that it will meet the goal or provide documentation to show that the mandatory good faith efforts have been made.

Type	Total	MBE%	WBE%
Construction	4.74%	3.26%	1.48%

The undersigned certifies that this bidder is aware of and will comply with MBE/WBE goals of this project and all applicable federal and state statutes and regulations concerning Disadvantage Business Enterprises (Minority and Woman-owned Business Enterprises).

We certify that should we be declared successful bidder we shall submit such data as required for award of the contract within the time limits set forth in the contract specifications unless otherwise specified. In addition, we acknowledge that Minority/Woman-Owned Business Enterprises Contract and Procurement Reports will be submitted to the City for each half year of active construction.

We understand that if we are the successful bidder and we fail to meet the MBE and/or WBE goals, or fail to demonstrate that we have made the required good faith effort the City can render the bid proposal non-responsive.

Company Name_____ ITB/RFP No. _____

Authorized Signature _____

Title _____

DBE Compliance Statement

Appendix C

Disadvantaged Business Enterprise Program
DBE Subcontractor Performance Form

TO BE SUBMITTED WITH THE BID
FOR EACH DBE SUBCONTRACTOR

NAME OF SUBCONTRACTOR:	**PROJECT NAME:**
ADDRESS:	**BID/PROPOSAL/PROJECT NO.:**
TELEPHONE NO.:	**E-MAIL ADDRESS (optional):**

ITEM OF WORK OR DESCRIPTION OF SERVICES BID TO PRIME ***If the bidder does not intend to utilize MBE or WBE subcontractors, AWWU Form 6100-3 must still be signed by bidder, and indicate "NONE TO BE USED"***	**PRICE OF WORK SUBMITTED TO PRIME CONTRACTOR** ***Must Include Estimated Dollar Amount***

Currently certified as a MBE or WBE by: _____

Signature of Prime Contractor _____ Date _____

Print Name _____

Title _____

Signature of Subcontractor _____ Date _____

Print Name _____

Title _____

*Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an ADEC award of financial assistance.

WHEN FIELD IS NOT APPLICABLE NOTE "N/A"

AWWU FORM 6100-3

Appendix D

Disadvantaged Business Enterprise Program
DBE Subcontractor/Prime Utilization Form

TO BE SUBMITTED WITHIN FIVE (5) WORKING DAYS OF NOTICE FROM MOA PURCHASING OFFICER

BID/PROPOSAL/PROJECT NO.:	**PROJECT NAME:**
NAME OF PRIME BIDDER:	**E-MAIL ADDRESS (optional):**
ADDRESS:	
TELEPHONE NO.:	**FAX NO. (optional):**

Please list below each DBE (MBE/ WBE) subcontractor/prime that will perform work under this contract, along with the contracted amount that will be applicable to the goal. Indicate whether the firm is MBE or WBE. If prime contractor is a MBE or WBE, they must identify themselves as well. If the prime/bidder does not intend to utilize MBE or WBE subcontractors, indicate "NONE TO BE USED". A bid submitted without adequate MBE/WBE participation or showing of good faith efforts to achieve such participation can render the bid non-responsive.

The following subcontractors will be used on this project:

COMPANY NAME, ADDRESS, PHONE NUMBER, E-MAIL ADDRESS AND AK CONTRACTOR'S LICENSE NO.	**TYPE OF WORK TO BE PERFORMED**	**ESTIMATED DOLLAR AMOUNT**	**CURRENTLY CERTIFIED AS MBE OR WBE?** *(Check Applicable)*	
			MBE	**WBE**

I certify under penalty of perjury that the forgoing statements are true and correct. In the event of a replacement of subcontractor, I will adhere to the replacements set forth in 40 CFR Part 33 Section 33.302(c).

_____
_____
Signature of Prime Contractor Date

_____
_____
Print Name Title

*Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an ADEC award of financial assistance.

WHEN FIELD IS NOT APPLICABLE NOTE "N/A"

AWWU FORM 6100-4

Appendix E

Disadvantaged Business Enterprise Program
DBE Subcontractor/Prime Participation Form

TO BE SUBMITTED FOR EACH DBE SUBCONTRACTOR EVERY 30 DAYS, AND WITH FINAL REQUEST FOR PAYMENT

NAME OF SUBCONTRACTOR*:	**PROJECT NAME:**
ADDRESS:	**CONTRACT NO:**
TELEPHONE NO:	**E-MAIL ADDRESS (optional):**
PRIME CONTRACTOR NAME:	

This report represents progress payment No. _____ or request for final payment _____.

Period covered by this report from _____ to _____.

Please use the space below to report any concerns regarding the above State-funded project (e.g., reason for termination by prime contractor, late payment, etc.).

_____

_____

CONTRACT ITEM NO.	ITEM OF WORK OR DESCRIPTION OF SERVICES RECEIVED FROM THE PRIME CONTRACTOR	CONTRACT AMOUNT	AMOUNT SUBCONTRACTOR/ PRIME WAS PAID FOR THIS PERIOD

Subcontractor's Signature **Title/Date**

*Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an ADEC award of financial assistance.

WHEN FIELD IS NOT APPLICABLE NOTE "N/A"

*If prime contractor is a MBE or WBE, they must complete an **AWWU Form 6100-2** for themselves*

AWWU FORM 6100-2

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 SEWER IMPROVEMENTS

PUMP STATION 12 FORCE MAIN / INTERCEPTOR C GRAVITY JUNCTION REHABILITATION

SECTION X

EEO CONTRACT COMPLIANCE SPECIFICATIONS

EEO Statement of Acknowledgement

EEO Special Provisions

STATE OF ALASKA
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

EQUAL EMPLOYMENT OPPORTUNITY STATEMENT OF ACKNOWLEDGEMENT

This statement of acknowledgement is required by the Equal Employment Opportunity Regulations of the Secretary of Labor (41 CFR 60-1.7(b)(1)) and must be completed by each Bidder and proposed Subcontractor participating in this contract.

PLEASE CHECK THE APPROPRIATE BOXES

THE ☐ Bidder ☐ proposed Subcontractor **hereby CERTIFIES:**

PART A. Bidders and proposed subcontractors with 50 or more employees and a federal contract amounting to $50,000 or more are required to submit one federal EEO-1 report during each year the two conditions (50 employees and a $50,000 federal contract) exist.

The company named below (Part C) is exempt from the requirements of submitting an EEO-1 report this year.

☐ NO (go to PART B) ☐ YES (go to PART C)

PART B. The company named below (Part C) has submitted an EEO-1 report this year:

☐ YES (go to PART C) ☐ NO (following reporting and instructions below)

On-line EEO-1 report filing may be accessed at the following web address:

https://egov.eeoc.gov/eeo1/eeo1.jsp , after EEO-1 go to PART C

EEO-1 reporting and instructions may be obtained by writing or e-mail to, although must be completed before proceeding to PART C:

EEO-1 Joint Reporting Committee
P.O. Box 78040
Washington, DC 20013-8040
Telephone 1-866-286-6440
Email: e1.techassistance@eeoc.gov

PART C.

_____ _____
Signature of Authorized Representative of Company Date

_____ (_____) _____
Name of Company Telephone No.

_____ _____
Address of Company Zip Code

_____ _____
Project Name Contract Number

EQUAL EMPLOYMENT OPPORTUNITY SPECIAL PROVISIONS

CONTRACT COMPLIANCE SPECIFICATIONS

Every municipal contract shall include language substantially the same as the following: The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, national origin, ancestry, age, sex, sexual orientation, gender identity, marital status, or physical or mental disability. The contract will comply with all laws concerning the prohibition of discrimination including, but not limited to, Title 5 and Title 7 of the Anchorage Municipal Code.

Every municipal contract shall state, in all solicitations or advertisements for employees to work under the contract, that all qualified applicants will receive consideration for employment without regard to race, color, religion, national origin, ancestry, age, sex, sexual orientation, gender identity, marital status, or physical or mental disability.

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 SEWER IMPROVEMENTS

PUMP STATION 12 FORCE MAIN / INTERCEPTOR C GRAVITY JUNCTION REHABILITATION

SECTION XI

RECORD DRAWINGS (UNDER SEPARATE COVER)

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 SEWER IMPROVEMENTS

PUMP STATION 12 FORCE MAIN / INTERCEPTOR C GRAVITY JUNCTION REHABILITATION

SECTION XII

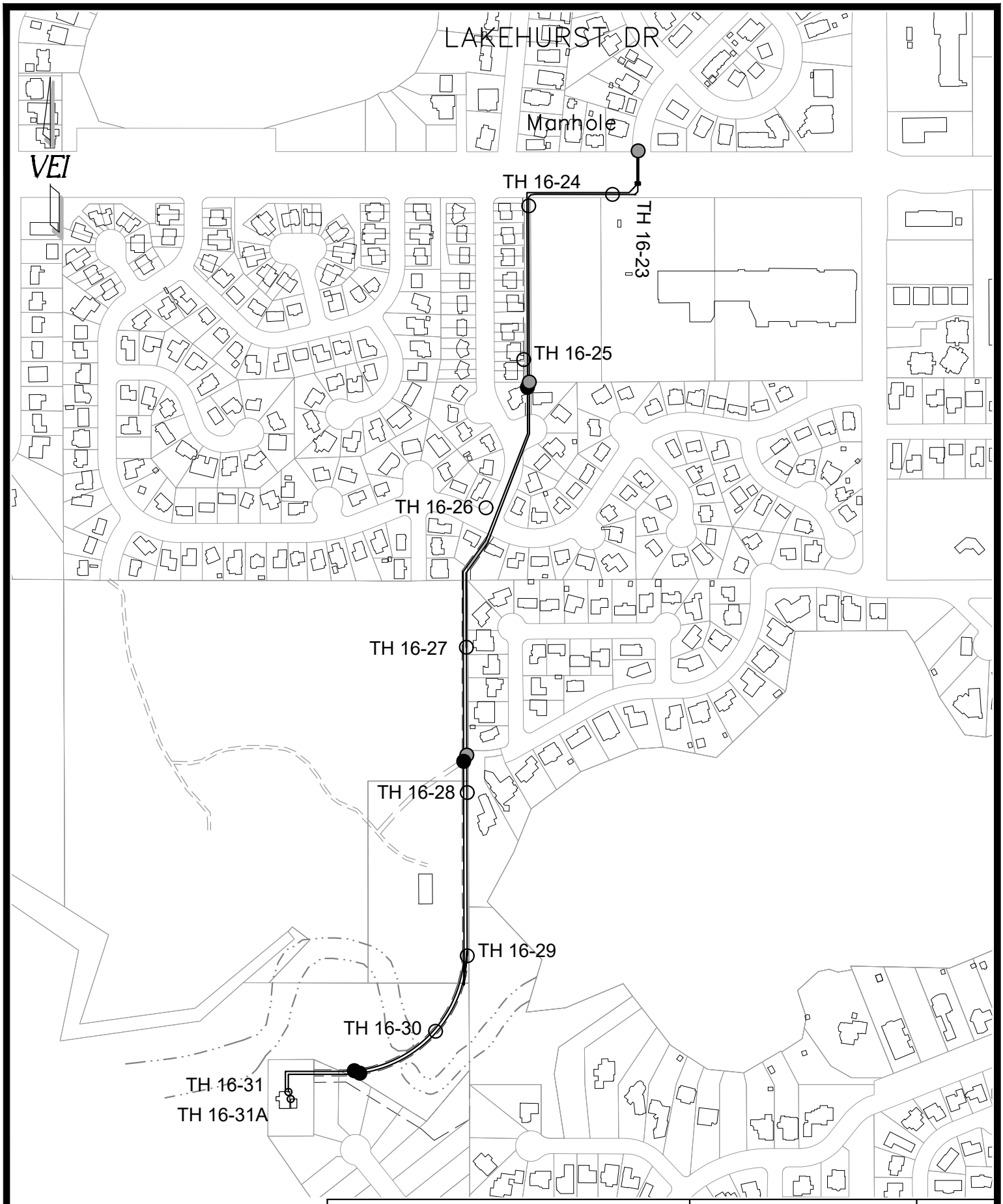
SOIL BORING LOGS

PUMP STATION 12
FORCE MAIN

SOILS
REPORT

COMPILED FROM RECORDS

By VEI 8-7-2018



VEI Consultants

1345 RUDAKOF CIR #201
ANCHORAGE, AK 99508

PHONE: 337-3330
FAX: 338-5386

PS12 FORCEMAIN

SOIL TEST HOLE LOCATIONS

SCALE:	1":200'
DATE:	8/7/18
DRAWN BY:	APH
GRID:	SW2425
VEI NO:	1700

2368

CAMPBELL CREEK FORCE MAIN No. 2

~~CONSTRUCTION~~

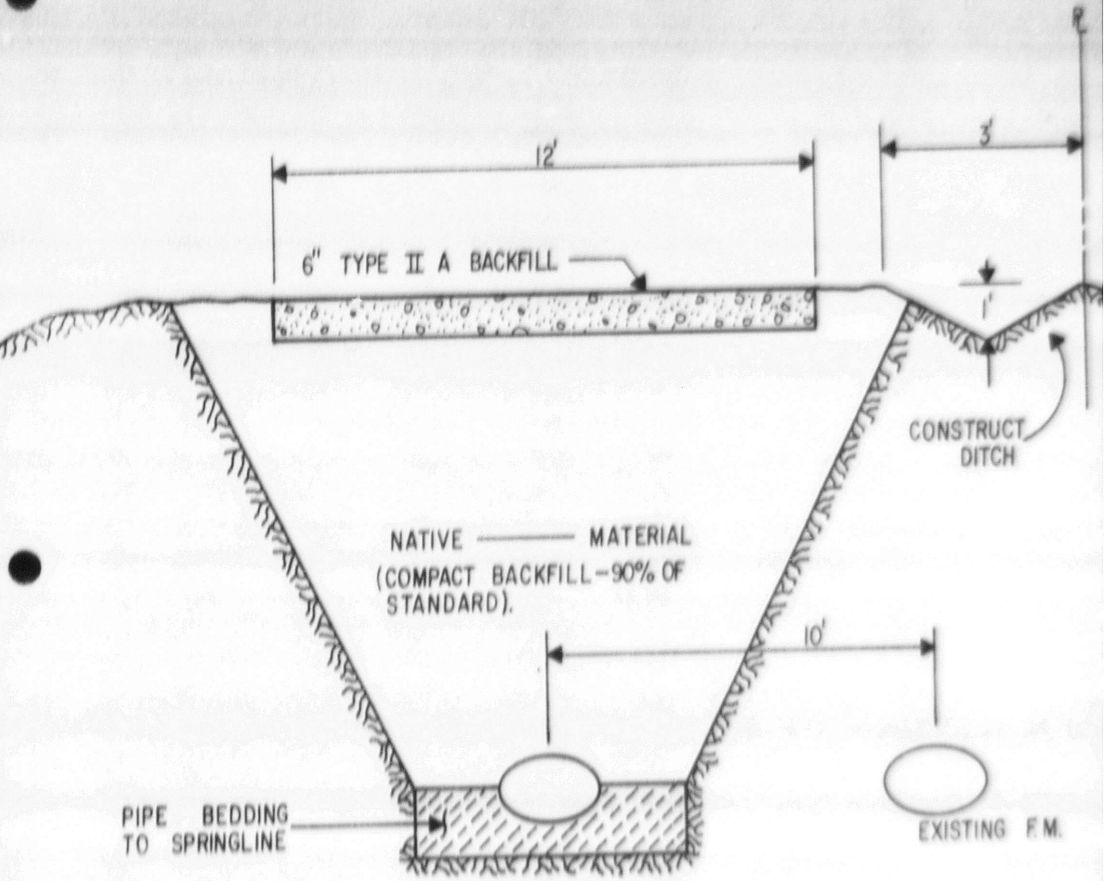
~~CONTRACT~~

~~BID DOCUMENTS~~

~~1978~~ 1976-78

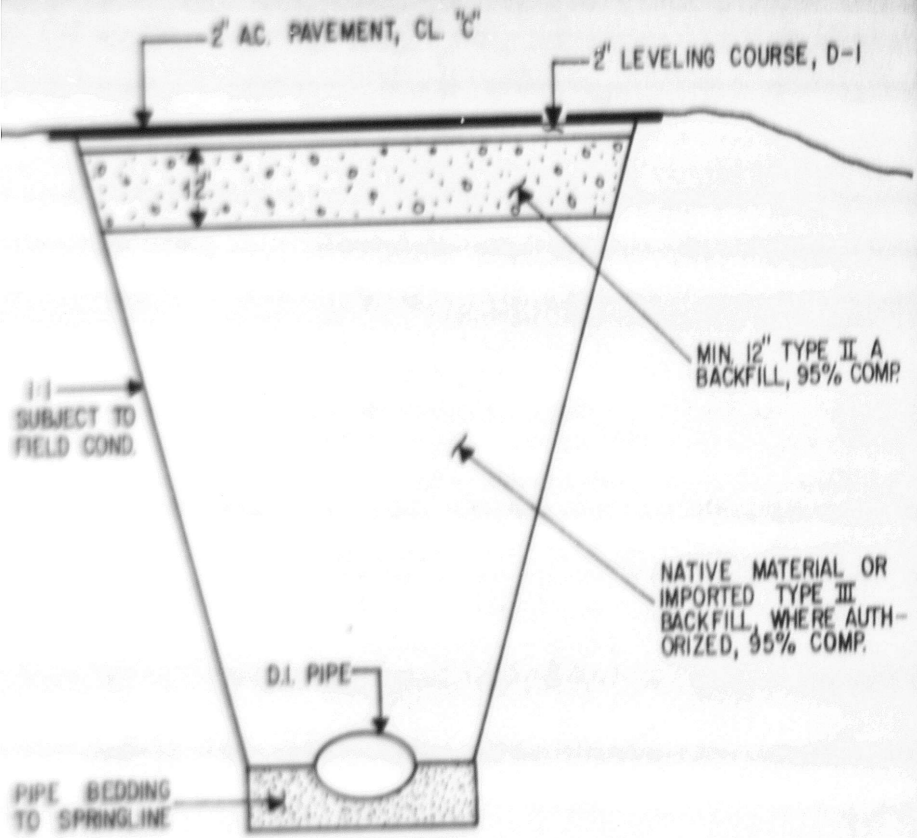
STORED BY ENGINEERING

6 of 6



TYPICAL TRENCH BACKFILL SECTION
STA. 13+00.00 TO 19+40.00

CAMPBELL CREEK FORCE MAIN
PHASE I



TYPICAL ROAD CROSSING

CAMPBELL CREEK FORCE MAIN
PHASE II

11. CAMPBELL CREEK CROSSING

Campbell Creek and its tributaries are considered salmon spawning streams by the Alaska State Department of Fish and Game, and any crossings of these streams shall be in accordance with regulations of the Department or such other State or Federal agency that exercises control over the streams. Curren fish and game regulations require that distrubance of the strea bed be held to a minimum. Every attempt shall be made to prevent spillage of backfill materials into the creek bed durin installation of crossing.

Filter Blanket

Materials for the filter blanket being disturbed during creek crossing shall consist of well-graded rock spalls from one inch to six inches in size.

Rip-Rap

Stone for rip-rap being disturbed during creek crossing shall be graded from the minimum size stone permitted, weighing approximately 100 pounds, to the maximum size stone permitted, weighing approximately 500 pounds. The greates dimension of any rock shall not be more than three times its smallest dimension.

MUNICIPALITY OF ANCHORAGE

SEWER UTILITY

CAMPBELL CREEK FORCE MAIN

PHASE II

SOILS ANALYSIS

Sub-soil investigations were carried out in the vicinity of this project. Five of the test holes were placed in early 1969 and the others during April and May of 1971 by means of a truck mounted auger. Results of these investigations are shown in the following test report. These investigations were carried out for design purposes only and are not considered adequate for construction. See following Soils Report.

The Municipality does not warrant the correctness of the soils investigation or of any interpretation, deduction or conclusion given in the report relative to sub-surface conditions. The bidder shall make his own deductions and conclusions as to the nature of the materials to be excavated, the difficulties which may arise from sub-surface conditions, and shall accept full responsibility therefore.

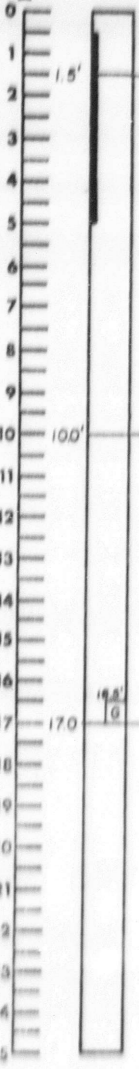
No extra payment will be made over and above the contract price on account of any difference between the information relating to soil and foundation conditions provided by the Municipality and the conditions disclosing at site of the work during the progress of the Contract.

CLIENT TN&H
PROJECT Job 2654

SHEET 25 OF 36
DATE June 1971
W.O. NO. 11446

T.H. 16-23 ELEV. 81.5 STA 135+15 Lakehurst & Dimond

DEPTH IN FEET



Frost 0.5'-5.0'
NFS, Brown, Damp, Well Graded Sandy Gravel With Trace Of Silt, Medium Density, Max. Size 3"

F-4, Brown, Damp-Wet, Peat With Much Wood Near Top, Loose Density

F-4, Grey, Damp, Fine Sandy Silt With Occasional Silty Sand Layers, Medium Density, No Plasticity

16.5'
0 Grab Sample

Bottom Of Hole 17.0'

CLIENT TN&H
PROJECT Job 2654

DATE 14 June 1971
W.O. NO. 11446

T.H. 16-24 ELEV. Not Available STA 32+10

DEPTH IN FEET

1.5' F-4, Brown, Damp, Peat

Water Table @ 2.0' During Drilling
Frost 2.0'-3.5'

F-4, Brown, Damp, Fine Sandy Silt, Dilatent, PL-

6.0' G Grab Sample

7.0' F-4, Brown, Damp, Silt With Trace Of Fine Sand, Stiff, Dilatent, No Plasticity

9.5' G Grab Sample

10.0' Bottom Of Hole 10.0'

SHEET 27 OF 36

CLIENT TN&H
PROJECT Job 2654

DATE 15 June 1971
W.O. NO. 11446

T.H. 16-25 ELEV. Not Available STA 27+10

DEPTH IN FEET

Frost 0.5'-1.5'
Water Table @ 1.5' During Drilling

5.0'
6.0'
Grab Sample

F-4, Brown, Damp-Saturated, Peat

11.0'
11.5'
Grab Sample
F-4, Grey, Damp, Slightly Clayey Silt, Stiff, PL+

Bottom Of Hole 11.5'

CLIENT TN&H
PROJECT Job 2654

SHEET 28 OF 36
DATE 15 June 1971
W.O. NO. 11446

T.H. 16-26 ELEV. Not Available STA 22+10

DEPTH IN FEET

0.5' F-4, Brown, Damp, Peat With Roots

Frost 0.75'-4.5'

F-4, Brown, Damp, Fine Sandy Silt, Stiff, No Plasticity

4.5'

F-4, Grey, Damp, Fine Sandy Silt, Stiff, No Plasticity

6.0'

Water Table @ 7.0' During Drilling

F-2/NFS, Grey, Damp-Saturated, Slightly Silty Fine Sand, Medium Density, Less Silt With Depth, NFS 8.0'-10.0'

9.5' Grab Sample

10.0'

Bottom Of Hole 10.0'

CLIENT TN&H
PROJECT Job 2654

SHEET 29 OF 36
DATE 1 June 1971
W.O. NO. 11446

T.H. 16-27 ELEV. 57.5 STA 17+25

DEPTH IN FEET

Frost To 2.0'
F-4, Brown, Peat

2.5'

F-4, Brown, Damp, Well Graded Fine Sandy Silt, Slight Dilatency

100
0
10.5' Grab Sample

Bottom Of Hole 10.5'

CLIENT TN&H
PROJECT Job 2654

SHEET 30 OF 36
DATE 1 June 1971
W.O. NO. 11446

T.H. 16-28 ELEV. 47.0 STA 12+35

DEPTH IN FEET

0.5' F-4, Brown, Damp, Peat, Loose Density
Frost 0.5'-1.5'

F-4, Brown, Well Graded Fine Sandy Silt, Slight Plasticity

10.0' 0 Grab Sample
10.5'

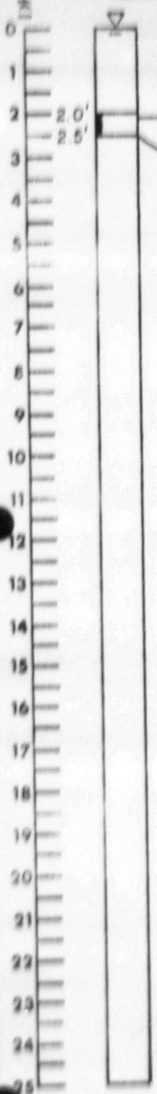
Bottom Of Hole 10.5'

SHEET 31 OF 36

CLIENT TM&H
PROJECT Job 2654

DATE 18 June 1971
W.O. NO. 11446

T.H. 16-29 ELEV. Not Available STA 7+30



Water Table @ Surface During Drilling

F-1, Grey, Saturated, Silty Sandy Gravel, Mediur Density, Well-Graded, Rounded, Max. Size 2"

Frost 2.0'-2.5'

F-4, Grey, Damp-Saturated, Fine Sandy Silt, Frozen

Bottom Of Hole 2.5'

Note: With Existing Frost Conditions Hole Could Not Be Drilled Further With Hand Auger.

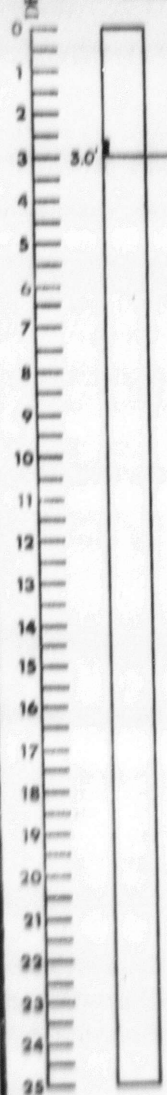
SHEET 32 OF 36

CLIENT TH&H
PROJECT Job 2654

DATE 18 June 1971
W.O. NO. 11446

T.H. 16-30 ELEV. Not Available STA 4+05

DEPTH IN FEET



F-4, Grey, Damp, Silt, Soft-Stiff, Possibly PL+

Frost 2.75'-3.0'

3.0'

Bottom Of Hole 3.0'

Note: With Existing Frost Conditions Hole Could Not Be Drilled Further By Hand Auger.

SHEET 33 OF 36

CLIENT TN&H

PROJECT Job 2654

DATE 2 June 1971

W.O. NO. 11446

T.H. 16-31 ELEV. 20 STA 0+80, 60'RT

DEPTH IN FEET

Frost 2.5'-5.5'

F-4, Brown, Damp, Silty Well Graded Fine Sand, High Plasticity

6.0'

F-4, Grey, Damp, Silty Well Graded Fine Sand, High Plasticity, Some Dilatency

9.5'

10.0'

G

F-2, Grey, Damp, Silty Well Graded Fine Sand, No Plasticity

Grab Sample

Bottom Of Hole 10.0'

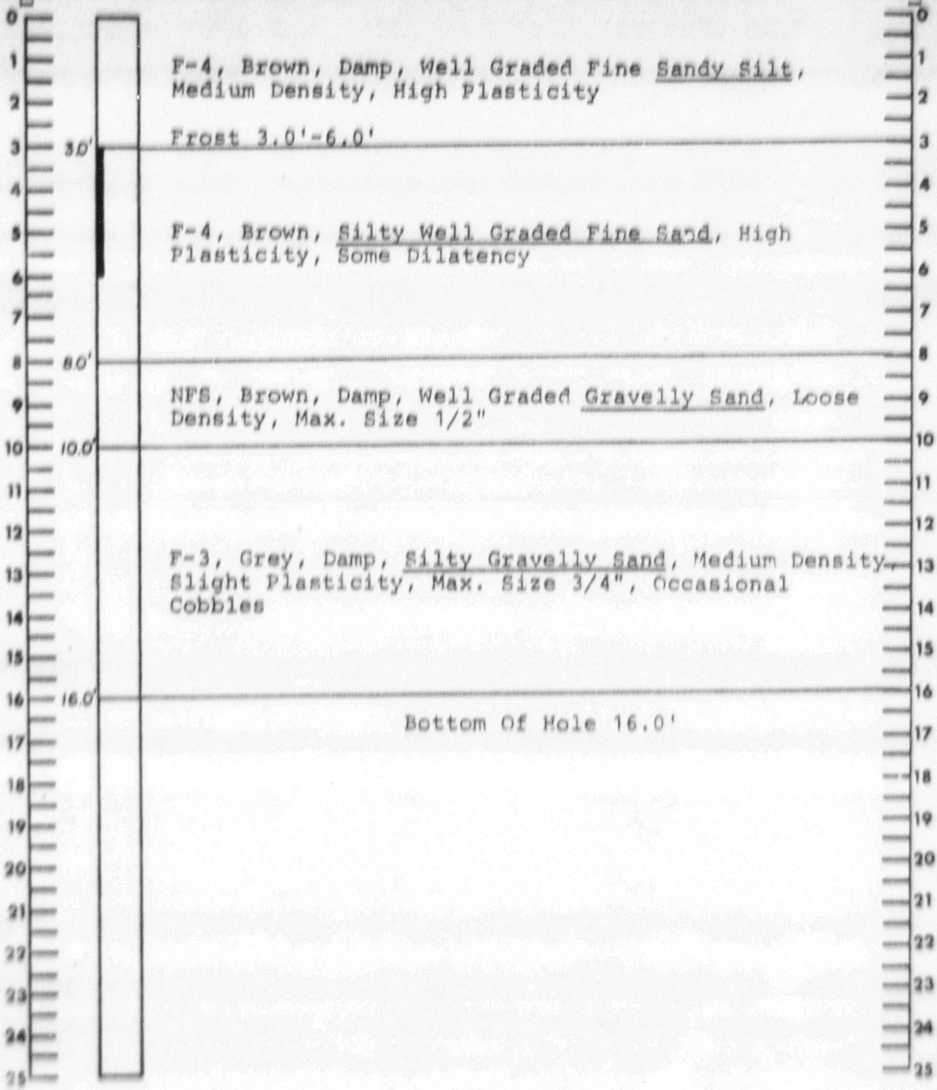
Note: Could Not Get Up On Top Of Knob With Rig To Drill. Put Hole @ Toe Of Bank Due West Of Hole Location.

SHEET 34 OF 36

CLIENT TH&H
PROJECT Job 2654

DATE 2 June 1971
W.O. NO. 11446

T.H. 16-31A ELEV. 29 STA 0-80, 70'RT



F-4, Brown, Damp, Well Graded Fine Sandy Silt, Medium Density, High Plasticity

Frost 3.0'-6.0'

F-4, Brown, Silty Well Graded Fine Sand, High Plasticity, Some Dilatency

NFS, Brown, Damp, Well Graded Gravelly Sand, Loose Density, Max. Size 1/2"

F-3, Grey, Damp, Silty Gravelly Sand, Medium Density, Slight Plasticity, Max. Size 3/4", Occasional Cobbles

Bottom Of Hole 16.0'

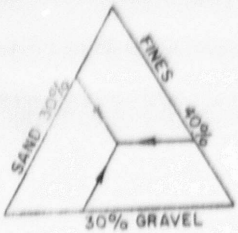
TEST HOLE LOGS
SOIL DESCRIPTIONS

The soil descriptions shown on the logs are the best estimate of the soil characteristics at the time of field examination. Such examinations do not achieve the precision of laboratory tests for the various properties.

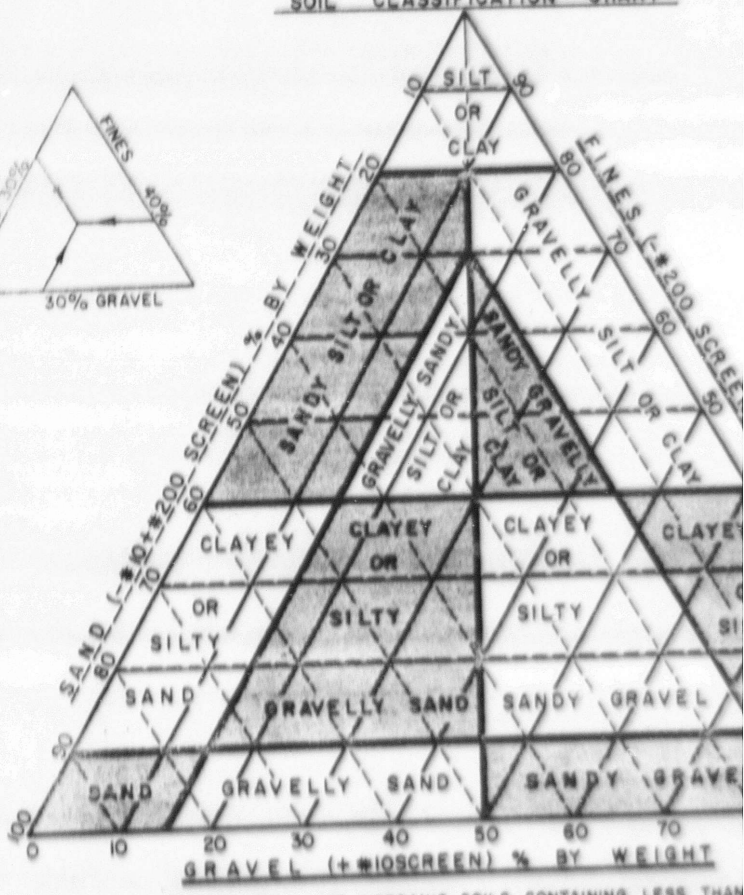
1. The relative type of soil and the frost classification is shown on the sheet "Soil Classification Chart."

2. Other criteria:

Boulder - greater than 8"
Cobble - approximately 3" to 8"
Blow Count - blows/6" of 140 lb. weight falling 30"; 2" split spoon. (The standard penetration is blows/12").
Density - estimated by the rate of drilling type of soil, blow count, and moisture range.
P_L - Plastic Limit, moisture content being approximated as; above (+) or below (-) plastic limit (P_L) or liquid limit (L_W) as appropriate.
L_W - Liquid Limit, see P_L
Dilatency - is the ability of water to migrate to the surface upon vibration or jolting of a sample, an aid in determining whether a soil is predominately a clay or silt.
Well graded - uniformity coefficient greater than 7
Poorly graded - uniformity coefficient less than 7 (Uniform particles, gap graded)
Organic Content - estimated by volume, not particularly precise.
Clayey Soils - a field method now being used as an aid to identification of these soils as a combination ball drop, and rolled thread test in which a 2" diameter ball of the Sand-Silt-Clay fraction is dropped 2' until a 1" thick pat develops. The diameter of a thread at crumbling rolled from the resultant pat determines whether clay or silt predominates.
Dry Strength - a small sample of the soil is formed into a cube and air dried, and crushed between the fingers. High dry strength indicates clays and low silts.
Water Table - the apparent water table at the time of observation. Often the actual water table may be higher unless the hole is allowed to remain open or is converted to an observation well.
Capillary Fringe - change from moist to very damp, or saturated soil, usually indicates that water table is close.
Peat - Fibrous material of macroscopic and microscopic fragments of decayed vegetable matter; very compressible, unsuitable for foundation or embankment. Color light brown to black.
As - The upper layer, surface soil or topsoil, containing humus and/or organic debris, not satisfactory for foundations.



SOIL CLASSIFICATION CHART



NONFROST SUSCEPTIBLE SOILS ARE INORGANIC SOILS CONTAINING LESS THAN

GROUPS OF FROST-SUSCEPTIBLE SOILS:

F1 GRAVELLY SOILS CONTAINING BETWEEN 3 AND 20% FINER THAN

F2 SANDY SOILS CONTAINING BETWEEN 3 AND 15% FINER THAN 0.0

F3 a. GRAVELLY SOILS CONTAINING MORE THAN 20% FINER THAN 0.02

(EXCEPT FINE SILTY, SANDS) CONTAINING MORE THAN 15% FINER

b. CLAYS WITH PLASTICITY INDEXES OF MORE THAN 12. EXCERT VA

F4 a. ALL SILTS INCLUDING SANDY SILTS

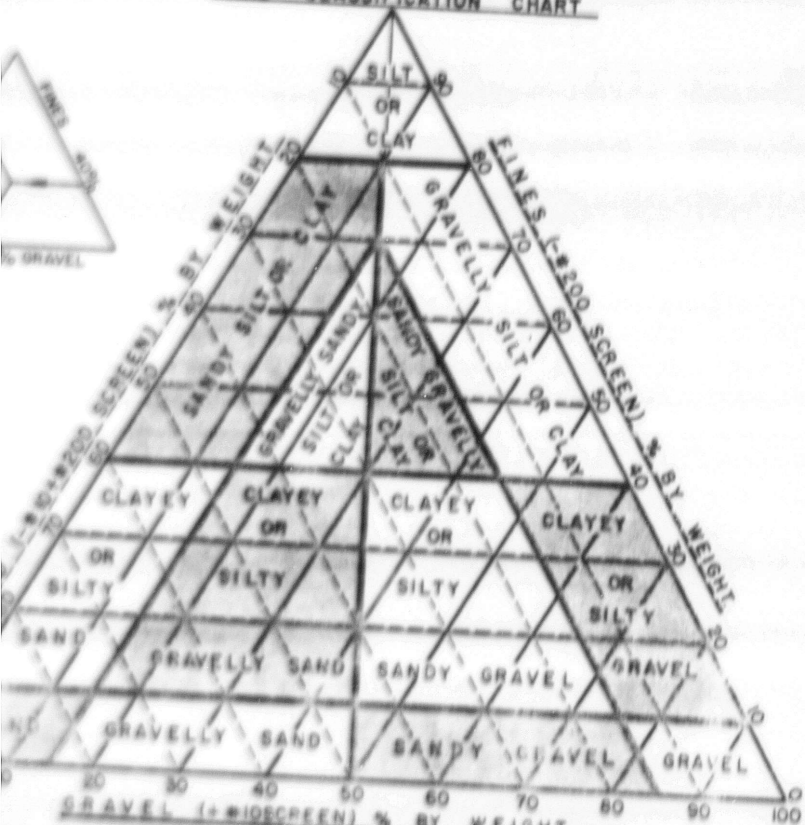
b. FINE SILTY SANDS CONTAINING MORE THAN 15% FINER THAN 0.0

c. LEAN CLAYS WITH PLASTICITY INDEXES OF LESS THAN 12.

d. VARVED CLAYS.

ALASKA TESTLAB

SOIL CLASSIFICATION CHART



SUSCEPTIBLE SOILS ARE INORGANIC SOILS CONTAINING LESS THAN 3% FINER THAN 0.02mm.
FROST-SUSCEPTIBLE SOILS:
GRAVELLY SOILS CONTAINING BETWEEN 3 AND 20% FINER THAN 0.02mm.
SANDY SOILS CONTAINING BETWEEN 3 AND 15% FINER THAN 0.02mm.
GRAVELLY SOILS CONTAINING MORE THAN 20% FINER THAN 0.02mm. AND SANDY SOILS
(EXCEPT FINE SILTY SANDS) CONTAINING MORE THAN 15% FINER THAN 0.02mm.
CLAYS WITH PLASTICITY INDEXES OF MORE THAN 12. EXCEPT VARVED CLAYS.
ALL SILTS INCLUDING SANDY SILTS.
FINE SILTY SANDS CONTAINING MORE THAN 15% FINER THAN 0.02mm.
CLAYS WITH PLASTICITY INDEXES OF LESS THAN 12.
CLAYS

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DRAFT

GEOTECHNICAL ENGINEERING REPORT

AWWU Pump Station 12 Force Main Improvements

ANCHORAGE, ALASKA

SHANNON & WILSON

July 2020

Shannon & Wilson No: 32-1-20115-001

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Submitted To: VEI Consultants
1345 Rudakof Circle
Suite 201
Anchorage, Alaska 99508
Attn: Mr. Vern Roelfs, PE

Subject: DRAFT GEOTECHNICAL ENGINEERING REPORT, AWWU PUMP STATION 12 FORCE MAIN IMPROVEMENTS, ANCHORAGE, ALASKA

Shannon & Wilson prepared this report and participated in this project as a subconsultant to VEI Consultants (VEI). Our scope of services was authorized in Amendment #1 to Subconsultant Agreement for Geotechnical Engineering, Pump Station 12 Rehab, AWWU Contract 2018001476 with VEI dated March 26, 2020. This report presents the results of subsurface explorations, laboratory testing, and geotechnical engineering studies conducted by Shannon & Wilson, Inc. for the proposed Pump Station 12 force main improvements in Anchorage, Alaska. This geotechnical engineering report was prepared by the undersigned.

We appreciate the opportunity to be of service to you on this project. If you have questions concerning this report, or we may be of further service, please contact us.

Sincerely,

SHANNON & WILSON, INC.

Ryan Collins, CPG
Senior Geologist

SKD/RDC:KLB

Kyle Brennan, PE
Vice President

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Appendix A: Laboratory Test Results
Important Information

1 INTRODUCTION

The purpose of this geotechnical study was to gather subsurface geotechnical and environmental data, and to make geotechnical engineering recommendations for design and construction of the project. To accomplish this, we advanced two geotechnical borings in the project area. Selected soil samples recovered from the borings were tested in our geotechnical laboratory. Presented in this report are descriptions of the site and project, subsurface explorations and laboratory test procedures, an interpretation of subsurface conditions, and our geotechnical engineering recommendations for design and construction of the project. Our work was conducted in general accordance with our March 13, 2020 proposal.

This report documents subsurface geotechnical conditions, provides analyses and interpretation of anticipated site conditions at the project, and presents the results of our engineering analyses. This report is intended for use by the project design engineering staff, VEI, and their representatives.

2 SITE AND PROJECT DESCRIPTION

The project is located near AWWU Pump Station 12 and Campbell Creek, approximately 850 feet downstream of Campbell Lake, in Anchorage, Alaska. The area is within the Turnagain Arm mudflats and the Anchorage Coastal Wildlife Refuge (ACWR). The area is primarily undeveloped, except for the existing sanitary sewer force main that crosses beneath Campbell Creek approximately 50 feet south of the rehabilitation project. Residential neighborhoods are present north, south, and east of the project area with the mudflats and Turnagain Arm to the west. The topography of the area immediately surrounding the project is relatively flat, with the exception of steep banks dropping about 10 feet to the incised creek below. A vicinity map indicating the general project location is presented as Figure 1. The site plan, included as Figure 2, shows prominent site features and the approximate boring locations.

We understand that the project generally consists of installing two, 24-inch diameter high density polyethylene (HDPE) sewer force mains. The new mains will be approximately 280 feet long and installed in a parallel configuration to provide a bypass repair around a damaged section of the existing main adjacent to the project. We understand the project also includes installation of two new manholes and will be installed using traditional open trench construction methods. We also understand that construction will take place in the winter months to reduce construction impacts to ACWR wetlands.

3 ENVIRONMENTAL RECORDS REVIEW

State database records were researched for pertinent information regarding the environmental conditions within the project area. For the purposes of this search, the project area, designated the "Project", is defined as described in Section 2 above.

3.1 Leaking Underground Storage Tank Database

The Alaska Department of Environmental Conservation's (ADEC's) Leaking Underground Storage Tank (LUST) database was reviewed April 27, 2020. One LUST site was identified within 0.25-mile of the project area.

The "MOA - AWWU Pump Station #12-UST" site is an "active" LUST site located at 4501 West 100th Avenue, about 300 feet west of the project area. The site was added in September 1990, when AWWU discovered a diesel fuel leak from a UST facility. Later in 1990, the UST was removed from the ground and some contaminated soil was excavated. Monitoring wells were installed in 1991 to help define the extent of the groundwater contamination. Additional contaminated soil was excavated was thermally treated off-site in 1993. An on-site drinking water well is located within 50 feet of the former UST leaking tank. Soil and groundwater contamination remain at this site. While contaminated groundwater and soil remain at the site, samples from the drinking water well have been non-detect for target analytes. In 2017, approximately 150 gallons of diesel fuel spilled inside the pump house, seeping through the cracked floor, and into the ground. Soil borings were advanced to investigate soil and groundwater contamination due to the spill. Contaminated soil was containerized and transported off site. Groundwater and drinking water well monitoring is ongoing at the site. Based on groundwater flow direction to the west-north, it is unlikely contamination from this site has impacted the project area.

3.2 Contaminated Sites Database

The ADEC Contaminated Sites database was reviewed April 27, 2020. One contaminated site was identified within 0.25-mile of the project area.

The "FAA Campbell Lake" site is located southwest of the Endeavor Circle and Pointe Resolution Drive intersection, about 900 feet southeast of the project area. The site was added to the ADEC database in 2013, petroleum-impacted soil was encountered about 12 feet below ground surface during a water line expansion. The source of the spill was a former UST owned by the United States Department of Transportation Federal Aviation Administration (FAA). The impacted soil was removed. Based on confirmation sampling activities in July 2016, the ADEC determined no further action was required and the site was

designated "cleanup complete". Based on the location and closure status, this site is unlikely to have impacted the project area.

4 SUBSURFACE EXPLORATIONS

Subsurface explorations for this study consisted of drilling and sampling two borings, designated Borings TB-1 and TB-2, in the project area on March 30, 2020. The boring locations were positioned by our representative in the field based on the map provided by VEI and to avoid conflicts with buried and overhead utilities. The boring locations, shown on Figure 2, were recorded with a handheld GPS unit that is generally considered accurate to within 20 feet horizontally and verified using existing site features. It should be noted that GPS accuracy may be affected by geographic features, tree canopies, and atmospheric anomalies. The surface elevations shown on the boring logs were estimated from topographic contours provided by the Municipality of Anchorage (MOA). Therefore, the boring locations shown on the site plan and the elevations reported on the boring logs should be considered approximate.

Drilling services for this project were provided by Discovery Drilling of Anchorage, Alaska, using a track-mounted, Geoprobe 6712DT drill rig. A representative from our firm was present during drilling to locate the borings, observe drill action, collect samples, log subsurface conditions, and observe groundwater conditions. We coordinated with the Call Locate Center to clear the boring locations of buried public utilities prior to drilling.

The borings were advanced with 3¼-inch inner diameter (ID), continuous flight, hollow-stem augers to a depth of about 41.5 feet below ground surface (bgs). As the borings were advanced, samples were recovered using standard penetration test (SPT) methods at 2.5-foot intervals to 10 feet bgs, then at 5-foot intervals to the base of our borings. In the SPT method, samples are recovered by driving a 2-inch outer diameter (OD) split-spoon sampler into the bottom of the advancing hole with blows of a 140-pound hammer free falling 30 inches onto the drill rod. For each sample, the number of blows required to drive the sampler the final 12 inches of an 18-inch penetration is recorded. Blow counts are shown graphically on the boring log figures as "penetration resistance" and are displayed adjacent to sample depth. The penetration resistance values give a measure of the relative density (compactness) or consistency (stiffness) of cohesionless or cohesive soils, respectively. In addition to the split spoon samples, a grab sample of the near-surface soils was collected from the auger cuttings in the upper 2 feet of each boring.

Samples of predominantly fine-grained soils were occasionally collected using 3-inch OD by 30-inch long, thin wall (Shelby) tubes to obtain relatively undisturbed samples for

laboratory testing. These samples were recovered by attaching the Shelby tube to the end of the drill rods and pushing the rods (and sampler) using hydraulic ram pressure from the rig into the soil at the bottom of the advancing boring. The sampling device was allowed to stay in the hole for approximately 5 to 10 minutes to allow the sample to adhere to the tube at which point it was removed from the bottom of the boring. The ends of the tubes were sealed with plastic caps, labeled, and fixed in an upright position for transporting to our Anchorage laboratory. The samples were extracted from the tubes in our laboratory and described in general accordance with the Unified Soil Classification System (USCS). Logs of the Shelby tube samples are included in Appendix A.

For samples recovered in soils exhibiting cohesive behavior, pocket vane shear tests were performed as per ASTM International (ASTM) D4648 and pocket penetrometer penetration readings were recorded to supplement blow counts as an estimation of that sample's stiffness.

The soil samples recovered during drilling were observed and described in the field in general accordance with the classification system described by ASTM D2488. Selected samples recovered during drilling were tested in our laboratory to refine our soil descriptions in general accordance with the Unified Soil Classification System (USCS) described in Figure 3 (3 sheets). Frost classifications were also estimated for samples based on laboratory testing (sieve analyses and percent passing the no. 200 sieve) and are shown on the boring logs. The frost classification system is presented in Figure 4. Summary logs of the borings are presented in Figures 5 and 6.

Soil samples recovered during drilling were "screened" for volatile organic vapors using a photoionization detector (PID) and a direct-screening technique. The PID was calibrated before screening activities with 100 parts per million (ppm) isobutylene standard gas. Field screening was conducted by creating an indentation in the soil of a fresh sample and taking a reading within the indentation. Field screening results are presented on the boring logs in Figures 5 and 6.

After drilling, the borings were completed by installing well casings to facilitate observation of groundwater levels. The well casing consists of a 1-inch diameter, hand-slotted, polyvinyl chloride (PVC) pipe. The annular space between the borehole wall and casing was backfilled with cuttings produced during drilling activity. The PVC was left with a "stick-up" of approximately 2 to 3 feet above the ground surface. Installation details for the observation wells are shown on the corresponding boring log.

5 LABORATORY TESTING

Laboratory tests were performed on selected soil samples recovered from the borings to confirm our field classifications and to estimate the index properties of the typical materials encountered at the site. The laboratory testing was formulated with emphasis on determining gradation properties, natural water content, and frost characteristics.

Water content tests were performed in general accordance with ASTM D2216. The results of the water content measurements are presented graphically on the boring logs in Figures 5 and 6.

Grain size classification (gradation) testing was performed to estimate the particle size distribution of selected samples from the borings. The gradation testing generally followed the procedures described in ASTM C117/C136. The test results are presented in Appendix A, Figure A-1 and summarized on the boring logs as percent gravel, percent sand, and percent fines. Percent fines on the boring logs are equal to the sum of the silt and clay fractions indicated by the percent passing the No. 200 sieve. Note that gradation testing indicates particle size only and visual classification under USCS designates the entire fraction of soil finer than the No. 200 sieve as silt. Plasticity characteristics (Atterberg Limits results) are required to differentiate between silt and clay soils under USCS.

Atterberg Limits were evaluated for four samples of cohesive/fine-grained soil recovered during drilling to estimate plasticity characteristics. This test generally followed procedures described in ASTM D4318. The results are presented in Appendix A, Figure A-2 and on the boring logs.

Strength testing was performed on samples of cohesive, fine-grained soils recovered from the borings. The procedures used to estimate the strength of the silt and/or clay soils included pocket penetrometer (PP) tests and torvane (TV) tests. PP and TV tests were performed on most of the fine-grained soil specimens in the field and in the laboratory on relatively undisturbed Shelby tube samples. These tests provide an estimate of the unconfined compressive strength and undrained shear strength of the sample, respectively. Remolded TV tests were also performed in the laboratory to estimate the sensitivity of the samples to disturbance by remolding the samples by hand and performing a TV test on a new flat surface. Tests were performed at horizontal and vertical orientations where possible. The results of the PP and TV measurements are presented on the boring logs as well as on the Shelby tube logs presented in Appendix A. PP and TV measurements on Shelby tube samples were taken after extrusion of the soil from the tube in the laboratory.

6 SUBSURFACE CONDITIONS

The subsurface conditions encountered at the site are depicted graphically on the boring logs on Figures 5 and 6. In general, our borings encountered predominantly fine-grained soils consisting of silt, silty clay, and clay with varying amounts of sand and gravel. The soil samples recovered during drilling were field screened for volatile organics using the PID. Screening results typically registered as 0.0 ppm and no visual or olfactory evidence of potential contamination was noted during drilling.

Based on typical penetration resistance values ranging from 2 to 22 blows per foot (bpf) and our observations of drill action, the predominantly fine-grained soils encountered during drilling are considered very soft to very stiff. In general, the softest soils were encountered in the upper 7 to 8 feet of each boring and the stiffest soils were encountered below about 23 to 24 feet bgs in each boring. Soils with blow counts greater than 50 blows per foot were recorded in Sample S9 from 30 feet bgs in Boring TB-1 and Sample S8 from 25 feet bgs in Boring TB-2. Based on our laboratory testing, moisture contents of predominantly fine-grained samples ranged from about 15 to 36 percent, with the highest moisture content values generally measured in samples collected from the upper 20 feet of the borings. Atterberg limits testing on four samples of fine-grained soil classified the material as silt and lean clay with a plasticity index ranging from nonplastic to 11 percent

Groundwater was encountered during drilling at a depth of approximately 15 feet bgs in Boring B-2 but was not observed during drilling in Boring TB-1. The apparent absence of groundwater in Boring TB-1 during drilling is likely a function of the relatively low hydraulic conductivity of the fine-grained soils at the site, which makes groundwater determination difficult during drilling. On April 10, 2020, approximately 10 days after drilling, water was measured at depths ranging between 0.8 and 6.9 feet bgs in the observation wells installed in the borings. The readings were taken approximately 1.5 hours after a high tide event. Similar water levels were measured during a subsequent reading taken during the following low tide suggesting a relatively slow response to tidal fluctuations. The difference in groundwater levels is difficult to explain but may be attributable to contributions from surface water runoff due to snow melt. Additional monitoring of groundwater levels may be needed to determine the groundwater response to tidal fluctuations. Note that water levels may fluctuate by several feet seasonally and may vary during periods of high precipitation and rapid snow melt.

7 ENGINEERING CONCLUSIONS

Geotechnical considerations associated with this project consist of controlling excavation slopes, developing pipe bedding, excavation backfill and compaction, addressing potential settlements, controlling construction drainage, and planning for possible dewatering needs for excavations below the groundwater table. Based on the conditions encountered by our borings, the soils in the project area generally consisted of predominantly silt, silty clay, and clay with varying amounts of sand and gravel. In our opinion, the soils below about 8 to 10 feet are relatively compact and should be adequate to support the proposed sewer improvements. Proper control of excavation (including construction dewatering) and backfilling activities will be paramount in achieving a well-constructed project.

7.1 Trench Excavation

Trenches, or excavations will be needed to install the new sewer main and access portions of the existing pipe. According to conceptual design drawings, the planned burial depth for the new main and manholes ranges between about 10 and 28 feet below the existing ground surface. The predominantly fine-grained, native soils encountered by our borings will likely be sensitive to moisture, equipment vibration, and excavation activities and care should be taken during construction to minimize disturbance as much as possible. In addition, we recommend that a flat nose bucket be used at the bottom of excavations to minimize disturbance of the support soils. Trenches should generally be constructed as presented in Figure 7. If buried utilities or existing structures are present near an excavation, they should be adequately supported and braced during construction.

We understand that the portion of new main to be installed beneath Campbell Creek is planned to be constructed "in the wet" to accommodate periodic tidal flooding and other surface and groundwater. This technique is intended to reduce construction cost and land impacts that could occur if cut-off walls were used to control water and facilitate dewatering. The soils encountered by our borings were typically nonplastic to low plasticity, fine-grained soils. During excavation, mineral soils above the water table may initially tend to stand relatively steeply, due to cohesion and apparent cohesion associated with the soil moisture. However, as the soils dry, they will tend to ravel and slough to their natural angle of repose, which for planning purposes is estimated at about 2 horizontal (H) to 1 vertical (V). Below the water table, or if surface water is allowed to enter the trench, silty/clayey soils may soften, squeeze, or slump over time, or due to disturbance, to slopes of 3 or 4 H to 1 V or shallower. Short-term (several days or less) construction slopes for excavations below the ground/surface water table on the order of 1H to 1V may be possible. The actual slope and excavation bottom conditions should be made the responsibility of the

contractor, who will be present on a day to day basis and can adjust efforts to obtain the needed stability and meet the applicable Alaska and Federal (OSHA) safety regulations.

Groundwater was encountered in Boring TB-2 at about 15 feet bgs during drilling and measured in the observation wells installed in our borings at depths ranging from about 1 to 7 feet bgs, approximately ten days after drilling. Based on our observations during drilling, and the gradation and compactness of the materials encountered, relatively slow groundwater inflow is anticipated where excavations penetrate the water table; however running ground conditions may occur in soft, nonplastic fine-grained soils or if layers of granular materials are encountered, which may make excavation side slopes difficult to maintain if groundwater is not controlled. Recommendations for construction drainage and dewatering are discussed in Section 7.7.

If wet conditions persist at the trench bottom, crushed aggregate may be used to stabilize the trench bottom (i.e. provide a firm unyielding surface on which to support the new pipe) and E chips may be used as a substitute for pipe bedding material. This should only be done if it is too wet to compact mineral soils, as E chips may be placed in relatively wet conditions and can be compacted with hand equipment. Additional considerations for pipe bedding are discussed in Section 7.3. Soils exposed at the bottom of the excavation will be susceptible to strength loss in the presence of excess moisture and vibration. Limited compaction effort of bedding soils with vibratory equipment should be conducted in the first lift of fill placed on the bottom of the trench.

We recommend that the contractor be required to submit an excavation plan once the utility layout and depths have been determined. The excavation plan should describe the methods and sequencing for excavation, as well as additional information for dewatering and shoring as necessary. The plan should highlight areas that may require dewatering, and include details for the type or types of dewatering that will be undertaken (including, but not limited to pumping methods and rates, discharge locations, treatment, etc.). The excavation plan should also include the types and locations of shoring to be used, and engineered plans for the shoring if required. The plan should also provide contingency plans for removing and handling large boulders during excavation activities. We recommend that we be retained to review the excavation plan prior to authorizing work to proceed at the site to ensure that the plan contains the necessary information and is appropriate for the conditions at the site.

7.2 Temporary Shoring and Lateral Earth Pressures

Temporary shoring may be needed to support excavation sidewalls during construction. The shoring should be designed to resist lateral earth pressures. For this project, we understand that the shoring would consist of a pre-fabricated, steel "trench box" structure with a maximum height of about 20 feet. Assuming an active earth pressure condition under static loading, an equivalent fluid weight of 42 pounds per cubic foot (pcf) is recommended for design of the shoring. To simulate seismic loading, the active earth pressure should be increased with a uniformly distributed, rectangular pressure prism of 12 pounds per square foot (per linear foot of structure) of wall height. For rigid walls that are restrained from deflecting at the top, an at-rest earth pressure condition would prevail and an equivalent fluid weight of 59 pcf is recommended. Lateral forces may be resisted by passive earth pressures against the structure walls which can be estimated using an equivalent fluid weight of 115 pcf. This value includes a factor of safety of at least 2 on the full passive earth pressure. Active and passive pressures are prismatic and act on the wall accordingly. Note, the active earth pressure value assumes the soils behind the wall are drained and does not include hydrostatic force and the passive pressure was calculated using buoyant unit weights assuming the soils outside the shoring are saturated. Shoring requirements to prevent sidewall failures and undercutting of nearby structures, roadways, and utilities should also consider wall side and surcharge loads if they fall within a plane line extending out and up at a slope of 1 horizontal (H) to 1 vertical (V) from the outer edge of the bottom of the excavation.

Basal heave can occur within shored or braced excavations. In general, this phenomenon occurs when the surcharge from the soil outside the braced excavation exceeds the shear strength of the soils below the base of the excavation and causes the soil in the excavation base rise, in turn potentially leading to ground settlement outside the excavation and potential failure of the shoring. Given that the soils at the base of the proposed manhole excavations are relatively compact, it is our opinion that basal heave is unlikely to occur, however, we recommend that the contractor observe the excavation area regularly for signs of basal heave or settlement outside the excavation. If these conditions are observed, work inside the excavation should be stopped immediately and the on-site Project Engineer notified of the condition.

7.3 Pipe Bedding

Silt and clay materials were encountered throughout our borings and will be expected in excavations for this project. As noted in Figure 7, we generally recommend bedding the pipes in a minimum of 6 inches of MOA Class E bedding material, or bedding material recommended by the manufacturer. This material may be difficult to place and compact

where the pipes will be installed in the wet. Therefore, in this area, we recommend using a poorly graded gravel material, such as MOA Type C or Type D Filter Material for pipe bedding. This type of material should have some ability to "flow" and level itself around the pipe in a wet environment. A rodding device may be used to assist with material placement to reduce the potential formation of voids beneath the pipes.

We also recommend that a woven geotextile be installed at the bottom of the excavation prior to placing the first lift of bedding material to reinforce any relatively loose or soft, native support soils during compaction of the pipe bedding. The geotextile fabric will also provide separation between the native soils and bedding materials. The fabric should extend up the sides of the trench wall to the top of the bedding and then be folded over to fully encapsulate the bedding layer. The fabric top and end seams may be joined by use of overlapping. A minimum of 12 inches of overlap is required. We recommend a Class 2 woven fabric as defined by the AASHTO M288. Tencate's Mirafi HP370 is an example of one material that meets these requirements. Because of the anticipated installation conditions, the geotextile may be omitted beneath portions of the pipe installed in the wet.

The bedding and fill material around the pipe should be compacted to at least 95 percent of the Modified Proctor maximum dry density, as discussed in Section 7.8 below, or per manufacturer recommendations to support and hold the pipe firmly in place to the extent that achieving this level of compaction is practical. This recommendation will be difficult to achieve if soft soils remain within 6 inches of the pipe and the contractor may find it beneficial to plan for additional excavation and replacement with the specified bedding material to provide a working base. Because the project generally traverses an undeveloped area the required degree of compaction may be relaxed at the discretion of the on-site Project Engineer.

7.4 Trench Backfill

Excavation backfill above the pipe can generally be placed in thicker lifts (up to 18 inches) and moderately compacted to achieve at least 90 percent compaction. Utility trenches and excavations should be backfilled with existing inorganic native soils placed in original stratigraphic sequence as much as practicable between the top of the pipe bedding and the ground surface. This procedure limits the contrast between trench backfill and the surrounding soil conditions that can lead to adverse settlement or frost heave behavior. Bulking of backfill into trenches should be discouraged as this can cause variable subgrade support or voids and lead to irregular surface settlements. If existing inorganic soils become difficult to compact during construction due to the material properties or additional backfill is needed, the contractor may utilize imported Type III classified fill, or better, as defined by the MOA Standard Specifications (MASS), at the discretion of the Project Engineer.

7.5 Pipe Settlements

The magnitudes of the settlements that will develop around the new utilities are dependent upon the applied loads, the gradation properties of the bedding and fill material, and the care with which the bedding and backfill are placed and compacted. Additionally, careful excavation and construction practices to minimize disturbance to support soils should be employed. If constructed according to the above recommendations, with proper soil type, placement, and compaction, it is estimated that total maximum settlements will be limited to elastic deflection of the bedding, or about ½-inch or less, of which all of it may be differential over a length of approximately 50 feet.

7.6 Manholes

We understand that the project includes installation of two manhole access points. We understand that the manhole access points will generally consist of hollow, cylindrically shaped, precast concrete structures that provide access to valves installed at the low point of the new force main, about 28 feet bgs. Design of below ground structures will need to consider the bearing support capabilities and frost characteristics of the soil, lateral earth pressures, and potential settlements. We acknowledge that many manhole structures are pre-engineered concrete structures. The information contained in the following sections is intended to allow the project engineer to confirm the soils assumptions used to pre-engineer the structures, or to custom-design structures for this project if necessary.

7.6.1 Subgrade Preparation

Potential frost heaving forces should be considered in preparing the subgrade for the access points. Based on laboratory testing, the fine-grained soils encountered within the expected frost zone (8 to 10 feet bgs) are considered extremely frost susceptibility with a typical frost classification of F4. For structures buried shallower than 10 feet, the structure should be founded on a minimum of one foot of compacted Type IIA fill bearing on native, inorganic sand and gravel. For structures that will be buried below the expected frost zone, the structures may be founded on compact, native or imported bedding materials. Around the sides of the structures, Type IIA structural fill should extend horizontally a minimum of 2 feet outward, placed and compacted as outlined in Section 7.8.

7.6.2 Soil Bearing Capacities and Earth Pressures

Assuming the subgrade for the access point structures are prepared as described in Section 7.6.1 and soils beneath the structures have not experienced significant strength loss due to saturation or vibration, the soils supporting the structures should have an allowable bearing capacity of approximately 4,000 pounds per square foot. This value assumes a minimum

burial depth of the manholes of 15 feet bgs. This bearing value may be increased by 1/3 for short-term seismic loading. Loading on the top of the structures from cover fills should be included in the weight calculation and should be estimated by calculating the volume of the soil directly over the structure and multiplying that volume by the fill soils unit weight. The unit weight of the fill over the structure will vary depending on the gradation of the fill materials and could range between 125 and 140 pounds per cubic foot for sandy and gravelly fills, respectively.

Hollow structures below ground will support earth fills and should be designed to resist lateral earth pressures. The magnitude of the pressure is dependent on the method of backfill placement, the type of backfill material, and drainage provisions. The lateral earth pressures provided in Section 7.2 can be used for design of manhole structures. Lateral resistance may also be developed in friction against sliding along the base of the manhole structure and may be computed using a coefficient of 0.4 between concrete and soil.

7.6.3 Settlements and Buoyancy

The magnitudes of the settlements that will develop under the manhole structures are dependent upon the applied loads, the gradation properties of the bedding and fill material, and the care with which the bedding and structural fills are placed and compacted. Given the generally firm and stiff nature of the native soils encountered in our borings below about 24 feet bgs, static (non-seismic) settlement of the manhole structures should be limited to about 1 inch or less provided the subgrade is prepared according to Section 7.6.1.

Based on groundwater observations made during drilling, the structure bottoms will be below the groundwater table and buoyant forces will need to be considered. Buoyant forces should be estimated as the volume of the submerged structure multiplied by 62.4 pcf. These forces will largely be compensated for by the weight of the structure and the skin friction between the soil and sides of the structure. For a moderately compacted, uniform, granular fill; skin friction can be approximated by multiplying the surface area of the sides of the structure in contact with the soil by the total active force of the soil acting on the side of the below grade structure (see Section 7.2) and a frictional coefficient of 0.4. If buoyant forces are not compensated by the weight of the structure and skin friction along the sides of the structure, modifications to the structure should be incorporated as necessary for additional resistance against buoyant forces.

7.7 Construction Dewatering and Surface Drainage

Based on our April 10, 2020 measurements in the piezometers installed in our borings, static water levels within the project area were between 0.8 and 6.9 feet bgs. These groundwater depths suggest that groundwater will be encountered during excavation work. Because the

soils are anticipated to be predominantly fine-grained, groundwater inflow is expected to be relatively low, except in lenses containing sand and gravel where increased inflows may occur. Excavations needed to construct the project are anticipated to range from about 15 to 28 feet below the existing ground surface. Wells, local well points, or another dewatering method, along with sumps and pumps, are typically recommended for excavations that penetrate more than 2 to 3 feet into water bearing zones. However, due to the predominantly fine-grained nature of the soils encountered in our borings, dewatering with sumps and pumping equipment may be appropriate for the relatively short-term excavations needed to construct the project. If it is determined that well points or other dewatering methods are required or preferred, additional analysis should be done to determine the required pumping rates. These measures may also need to be used in tandem with temporary shoring or trench boxes to control trench walls, especially where trenches are to be excavated near existing structures. Also, construction should be staged so that a minimum length of trench is left open for as short a time as possible.

Based on our experience, and for preliminary planning purposes, we estimate initial pumping rates on the order of 5 to 50 gallons per minute (gpm) assuming 15-foot by 30-foot excavation and a drawdown on the order of 20 feet. The rates will decrease as the soils drain, such that pumping rates are roughly half of the initial pumping rates after seven days of pumping. These rates and associated drawdowns are for planning purposes only and should be verified in the field. The relatively wide range of estimated discharge rates are a product of uncertainty associated with the empirical methods used to estimate hydraulic conductivity, our assumption regarding excavation geometry, and the construction means and methods. Additional testing and analyses would be needed to refine our knowledge of the aquifer characteristics and the estimated pumping rates. Permits from Alaska Department of Natural Resources (DNR), ADEC, and potentially other state and local agencies, will also be required for construction dewatering.

Another critical water condition during construction will likely be surface water or runoff entering excavations. Thus, the ground around open excavations should be contoured to direct surface water around the excavations. Excavation and backfilling work should be closely coordinated such that seepage and surface runoff is not allowed to collect and stand in open trenches for long time periods. Exposed silty soils should be protected from additional moisture during construction as they are likely moisture sensitive and may lose significant strength if saturated.

7.8 Structural Fill and Compaction

Structural fill will be needed for excavation backfill. Classified structural fill that is imported should be clean, granular soil free of organic material. Gradation properties for the classified materials mentioned in this report are included in Figure 8.

The soils encountered in our borings in the project area are predominantly fine-grained and do not meet the gradation requirements for granular classified fills. These soils are unsuitable for reuse in structural applications but may be reused as unclassified fill for utility trench backfill provided the contractor can demonstrate the ability to place and compact the material with proper moisture density control.

Structural fills below any roadways should be placed in lifts not to exceed 10 to 12 inches loose thickness and compacted to at least 95 percent of the maximum dry density as determined by the Modified Proctor compaction procedure (ASTM D1557). Non-structural fills, including fills that are not subject to traffic loads, should be compacted to at least 90 percent of the Modified Proctor optimum dry density. Bulking of backfill into the trench should be discouraged as this can cause voids and lead to large future surface settlements. During fill placement, we recommend that large cobbles or boulders with dimensions in excess of 8 inches be removed from any structural fills.

8 CLOSURE AND LIMITATIONS

This report was prepared for the exclusive use of our client, VEI, AWWU, and their representatives for evaluating the site as it relates to the geotechnical aspects discussed herein. The conclusions and interpretation contained in this report are based on site conditions as they presently exist. It is assumed that the exploratory borings are representative of the subsurface conditions throughout the site, i.e., the subsurface conditions everywhere are not significantly different from those disclosed by the explorations.

If there is a substantial lapse of time between the submittal of this report and the start of work at the site, or if conditions have changed due to natural causes or construction operations at or adjacent to the site, it is recommended that this report be reviewed to determine the applicability of the conclusions considering the changed conditions and time lapse. Unanticipated soil conditions are commonly encountered and cannot fully be determined by merely taking soil samples or advancing test holes. Please read the Important Information section at the back of this report to reduce your project risks.

Copies of documents that may be relied upon by our client are limited to the printed copies (also known as hard copies) that are signed or sealed by Shannon & Wilson with a wet, blue ink signature. Files provided in electronic media format are furnished solely for the convenience of the client. Any conclusion or information obtained or derived from such electronic files shall be at the user's sole risk. If there is a discrepancy between the electronic files and the hard copies, or you question the authenticity of the report please contact us.

Map adapted from files provided by the Alaska Department of Natural Resources

N

0 1.5 3

Miles

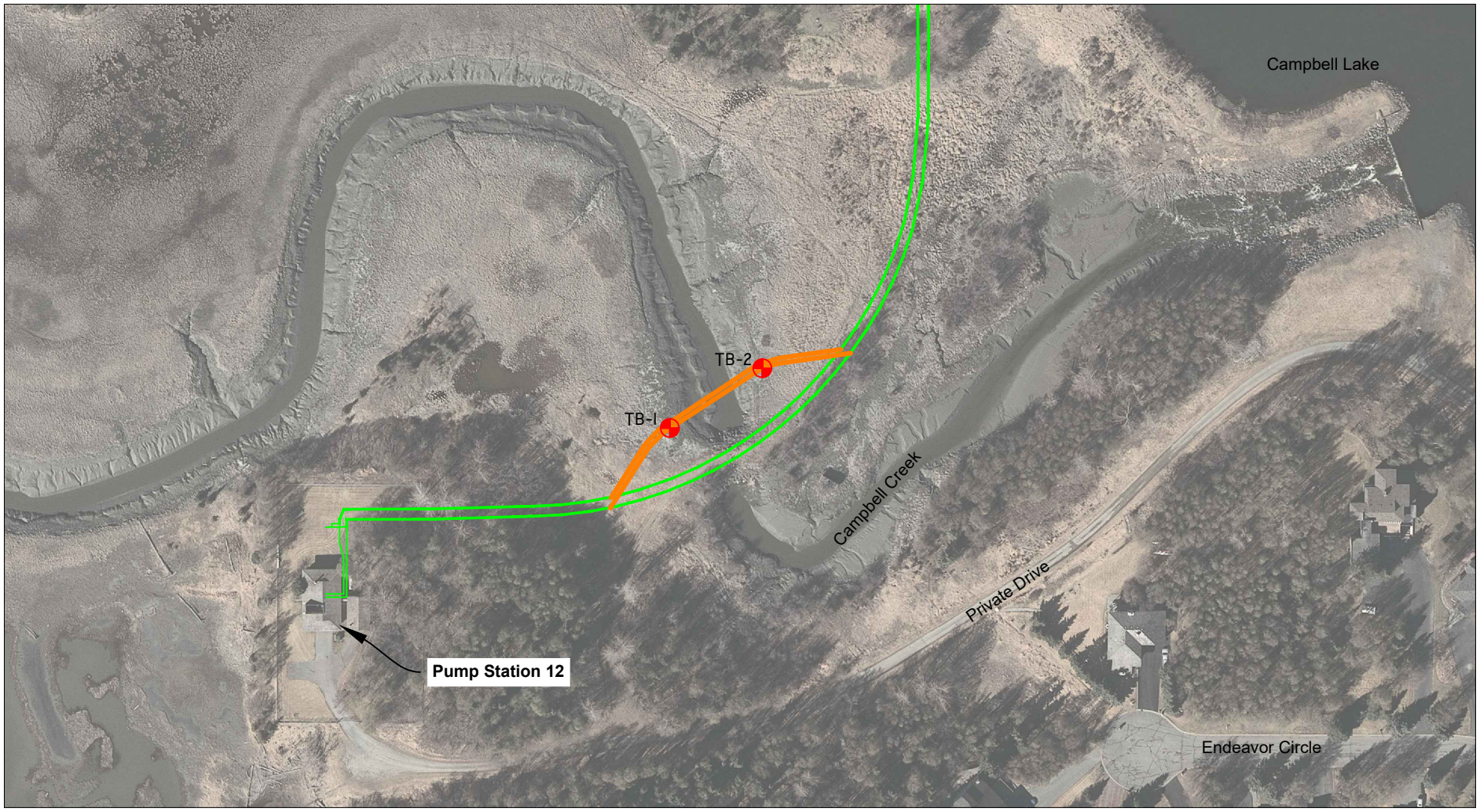
Pump Station 12 Force Main Improvements
Anchorage, Alaska

VICINITY MAP

July 2020 32-1-20115-001

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 1



LEGEND

TB-1 Approximate location of Boring TB-1, Advanced by Shannon & Wilson, March 2020

Approximate location of existing sewer force main

Approximate location of proposed new force main segment

NOTES

1. Map adapted from aerial imagery provided by Municipality of Anchorage. Image date: May 2015

N

0 75 150 300

APPROXIMATE SCALE IN FEET

Pump Station 12 Force Main Improvements
Anchorage, Alaska

SITE PLAN

July 2020 32-1-20115-001

SHANNON & WILSON, INC.
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FIG. 2

Shannon & Wilson, Inc. (S&W), uses a soil identification system modified from the Unified Soil Classification System (USCS). Elements of the USCS and other definitions are provided on this and the following pages. Soil descriptions are based on visual-manual procedures (ASTM D2488) and laboratory testing procedures (ASTM D2487), if performed.

S&W INORGANIC SOIL CONSTITUENT DEFINITIONS

CONSTITUENT[2]	FINE-GRAINED SOILS (50% or more fines)[1]	COARSE-GRAINED SOILS (less than 50% fines)[1]
Major	***Silt, Lean Clay, Elastic Silt,*** or ***Fat Clay***[3]	***Sand*** or ***Gravel***[4]
Modifying (Secondary) Precedes major constituent	30% or more coarse-grained: ***Sandy*** or ***Gravelly***[4]	More than 12% fine-grained: ***Silty*** or ***Clayey***[3]
Minor Follows major constituent	15% to 30% coarse-grained: ***with Sand*** or ***with Gravel***[4]	5% to 12% fine-grained: ***with Silt*** or ***with Clay***[3]
	30% or more total coarse-grained *and* lesser coarse-grained constituent is 15% or more: ***with Sand*** or ***with Gravel***[5]	15% or more of a second coarse-grained constituent: ***with Sand*** or ***with Gravel***[5]

[1]All percentages are by weight of total specimen passing a 3-inch sieve.
[2]The order of terms is: *Modifying Major with Minor*.
[3]Determined based on behavior.
[4]Determined based on which constituent comprises a larger percentage.
[5]Whichever is the lesser constituent.

MOISTURE CONTENT TERMS

Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, from below water table

STANDARD PENETRATION TEST (SPT) SPECIFICATIONS

Hammer:	140 pounds with a 30-inch free fall. Rope on 6- to 10-inch-diam. cathead 2-1/4 rope turns, > 100 rpm NOTE: If automatic hammers are used, blow counts shown on boring logs should be adjusted to account for efficiency of hammer.
Sampler:	10 to 30 inches long Shoe I.D. = 1.375 inches Barrel I.D. = 1.5 inches Barrel O.D. = 2 inches
N-Value:	Sum blow counts for second and third 6-inch increments. Refusal: 50 blows for 6 inches or less; 10 blows for 0 inches.

NOTE: Penetration resistances (N-values) shown on boring logs are as recorded in the field and have not been corrected for hammer efficiency, overburden, or other factors.

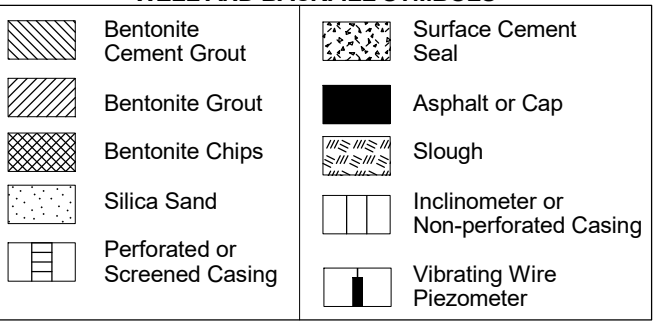
PARTICLE SIZE DEFINITIONS

DESCRIPTION	SIEVE NUMBER AND/OR APPROXIMATE SIZE
FINES	< #200 (0.075 mm = 0.003 in.)
SAND	
Fine	#200 to #40 (0.075 to 0.4 mm; 0.003 to 0.02 in.)
Medium	#40 to #10 (0.4 to 2 mm; 0.02 to 0.08 in.)
Coarse	#10 to #4 (2 to 4.75 mm; 0.08 to 0.187 in.)
GRAVEL	
Fine	#4 to 3/4 in. (4.75 to 19 mm; 0.187 to 0.75 in.)
Coarse	3/4 to 3 in. (19 to 76 mm)
COBBLES	3 to 12 in. (76 to 305 mm)
BOULDERS	> 12 in. (305 mm)

RELATIVE DENSITY / CONSISTENCY

COHESIONLESS SOILS		COHESIVE SOILS	
N, SPT, BLOWS/FT.	RELATIVE DENSITY	N, SPT, BLOWS/FT.	RELATIVE CONSISTENCY
< 4	Very loose	< 2	Very soft
4 - 10	Loose	2 - 4	Soft
10 - 30	Medium dense	4 - 8	Medium stiff
30 - 50	Dense	8 - 15	Stiff
> 50	Very dense	15 - 30	Very stiff
		> 30	Hard

WELL AND BACKFILL SYMBOLS



PERCENTAGES TERMS [1, 2]

Trace	< 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

[1]Gravel, sand, and fines estimated by mass. Other constituents, such as organics, cobbles, and boulders, estimated by volume.

[2]Reprinted, with permission, from ASTM D2488 - 09a Standard Practice for Description and Identification of Soils (Visual-Manual Procedure), copyright ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428. A copy of the complete standard may be obtained from ASTM International, www.astm.org.

Pump Station 12 Force Main Improvements
Anchorage, Alaska

SOIL DESCRIPTION AND LOG KEY

July 2020 32-1-20115-001

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 3
Sheet 1 of 3

2013 BORING CLASS1 PS12 2020.GPJ SWNEW.GDT 7/17/20

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)
(Modified From USACE Tech Memo 3-357, ASTM D2487, and ASTM D2488)

MAJOR DIVISIONS			GROUP/GRAPHIC SYMBOL		TYPICAL IDENTIFICATIONS
COARSE-GRAINED SOILS *(more than 50% retained on No. 200 sieve)*	Gravels *(more than 50% of coarse fraction retained on No. 4 sieve)*	Gravel *(less than 5% fines)*	GW		Well-Graded Gravel; Well-Graded Gravel with Sand
			GP		Poorly Graded Gravel; Poorly Graded Gravel with Sand
		Silty or Clayey Gravel *(more than 12% fines)*	GM		Silty Gravel; Silty Gravel with Sand
			GC		Clayey Gravel; Clayey Gravel with Sand
	Sands *(50% or more of coarse fraction passes the No. 4 sieve)*	Sand *(less than 5% fines)*	SW		Well-Graded Sand; Well-Graded Sand with Gravel
			SP		Poorly Graded Sand; Poorly Graded Sand with Gravel
		Silty or Clayey Sand *(more than 12% fines)*	SM		Silty Sand; Silty Sand with Gravel
			SC		Clayey Sand; Clayey Sand with Gravel
FINE-GRAINED SOILS *(50% or more passes the No. 200 sieve)*	Silts and Clays *(liquid limit less than 50)*	Inorganic	ML		Silt; Silt with Sand or Gravel; Sandy or Gravelly Silt
			CL		Lean Clay; Lean Clay with Sand or Gravel; Sandy or Gravelly Lean Clay
		Organic	OL		Organic Silt or Clay; Organic Silt or Clay with Sand or Gravel; Sandy or Gravelly Organic Silt or Clay
	Silts and Clays *(liquid limit 50 or more)*	Inorganic	MH		Elastic Silt; Elastic Silt with Sand or Gravel; Sandy or Gravelly Elastic Silt
			CH		Fat Clay; Fat Clay with Sand or Gravel; Sandy or Gravelly Fat Clay
		Organic	OH		Organic Silt or Clay; Organic Silt or Clay with Sand or Gravel; Sandy or Gravelly Organic Silt or Clay
HIGHLY-ORGANIC SOILS	Primarily organic matter, dark in color, and organic odor		PT		Peat or other highly organic soils (see ASTM D4427)

NOTE: No. 4 size = 4.75 mm = 0.187 in.; No. 200 size = 0.075 mm = 0.003 in.

NOTES

1. Dual symbols *(symbols separated by a hyphen, i.e., SP-SM, Sand with Silt)* are used for soils with between 5% and 12% fines or when the liquid limit and plasticity index values plot in the CL-ML area of the plasticity chart. Graphics shown on the logs for these soil types are a combination of the two graphic symbols (e.g., SP and SM).

2. Borderline symbols *(symbols separated by a slash, i.e., CL/ML, Lean Clay to Silt; SP-SM/SM, Sand with Silt to Silty Sand)* indicate that the soil properties are close to the defining boundary between two groups.

Pump Station 12 Force Main Improvements
Anchorage, Alaska

SOIL DESCRIPTION AND LOG KEY

July 2020 32-1-20115-001

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 3
Sheet 2 of 3

2013_BORING_CLASS2_PS12 2020.GPJ SWNEW.GDT 7/17/20

GRADATION TERMS

Poorly Graded	Narrow range of grain sizes present or, within the range of grain sizes present, one or more sizes are missing (Gap Graded). Meets criteria in ASTM D2487, if tested.
Well-Graded	Full range and even distribution of grain sizes present. Meets criteria in ASTM D2487, if tested.

CEMENTATION TERMS[1]

Weak	Crumbles or breaks with handling or slight finger pressure
Moderate	Crumbles or breaks with considerable finger pressure
Strong	Will not crumble or break with finger pressure

PLASTICITY[2]

DESCRIPTION	VISUAL-MANUAL CRITERIA	APPROX. PLASITICTY INDEX RANGE
Nonplastic	A 1/8-in. thread cannot be rolled at any water content.	< 4
Low	A thread can barely be rolled and a lump cannot be formed when drier than the plastic limit.	4 to 10
Medium	A thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. A lump crumbles when drier than the plastic limit.	10 to 20
High	It take considerable time rolling and kneading to reach the plastic limit. A thread can be rerolled several times after reaching the plastic limit. A lump can be formed without crumbling when drier than the plastic limit.	> 20

ADDITIONAL TERMS

Mottled	Irregular patches of different colors.
Bioturbated	Soil disturbance or mixing by plants or animals.
Diamict	Nonsorted sediment; sand and gravel in silt and/or clay matrix.
Cuttings	Material brought to surface by drilling.
Slough	Material that caved from sides of borehole.
Sheared	Disturbed texture, mix of strengths.

PARTICLE ANGULARITY AND SHAPE TERMS[1]

Angular	Sharp edges and unpolished planar surfaces.
Subangular	Similar to angular, but with rounded edges.
Subrounded	Nearly planar sides with well-rounded edges.
Rounded	Smoothly curved sides with no edges.
Flat	Width/thickness ratio > 3.
Elongated	Length/width ratio > 3.

ACRONYMS AND ABBREVIATIONS

ATD	At Time of Drilling
Diam.	Diameter
Elev.	Elevation
ft.	Feet
FeO	Iron Oxide
gal.	Gallons
Horiz.	Horizontal
HSA	Hollow Stem Auger
I.D.	Inside Diameter
in.	Inches
lbs.	Pounds
MgO	Magnesium Oxide
mm	Millimeter
MnO	Manganese Oxide
NA	Not Applicable or Not Available
NP	Nonplastic
O.D.	Outside Diameter
OW	Observation Well
pcf	Pounds per Cubic Foot
PID	Photo-Ionization Detector
PMT	Pressuremeter Test
ppm	Parts per Million
psi	Pounds per Square Inch
PVC	Polyvinyl Chloride
rpm	Rotations per Minute
SPT	Standard Penetration Test
USCS	Unified Soil Classification System
q_u	Unconfined Compressive Strength
VWP	Vibrating Wire Piezometer
Vert.	Vertical
WOH	Weight of Hammer
WOR	Weight of Rods
Wt.	Weight

STRUCTURE TERMS[1]

Interbedded	Alternating layers of varying material or color with layers at least 1/4-inch thick; singular: bed.
Laminated	Alternating layers of varying material or color with layers less than 1/4-inch thick; singular: lamination.
Fissured	Breaks along definite planes or fractures with little resistance.
Slickensided	Fracture planes appear polished or glossy; sometimes striated.
Blocky	Cohesive soil that can be broken down into small angular lumps that resist further breakdown.
Lensed	Inclusion of small pockets of different soils, such as small lenses of sand scattered through a mass of clay.
Homogeneous	Same color and appearance throughout.

[1]Reprinted, with permission, from ASTM D2488 - 09a Standard Practice for Description and Identification of Soils (Visual-Manual Procedure), copyright ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428. A copy of the complete standard may be obtained from ASTM International, www.astm.org.
[2]Adapted, with permission, from ASTM D2488 - 09a Standard Practice for Description and Identification of Soils (Visual-Manual Procedure), copyright ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428. A copy of the complete standard may be obtained from ASTM International, www.astm.org.

Pump Station 12 Force Main Improvements
Anchorage, Alaska

SOIL DESCRIPTION AND LOG KEY

July 2020 32-1-20115-001

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FIG. 3
Sheet 3 of 3

2013 BORING CLASS3 PS12 2020.GPJ SWNEW.GDT 7/17/20

FROST CLASSIFICATION

(after Municipality of Anchorage, 2007)

GROUP		0.02 Mil.	P-200*	USC SYSTEM (based on P-200 results)
NFS	Sandy Soils	0 to 3	0 to 6	SW, SP, SW-SM, SP-SM
	Gravelly Soils	0 to 3	0 to 6	GW, GP, GW-GM, GP-GM
F1	Gravelly Soils	3 to 10	6 to 13	GM, GW-GM, GP-GM
F2	Sandy Soils	3 to 15	6 to 19	SP-SM, SW-SM, SM
	Gravelly Soils	10 to 20	13 to 25	GM
F3	Sands, except very fine silty sands**	Over 15	Over 19	SM, SC
	Gravelly Soils	Over 20	Over 25	GM, GC
	Clays, PI>12			CL, CH
F4	All Silts	Over 15	Over 19	ML, MH
	Very fine silty sands**			SM, SC
	Clays, PI<12			CL, CL-ML
	Varved clays and other fined grained, banded sediments			CL and ML CL, ML, and SM; SL, SH, and ML; CL, CH, ML, and SM

PI = Plasticity Index
P-200 = Percent passing the number 200 sieve
0.02 Mil. = Percent material below 0.02 millimeter grain size

*Approximate P-200 value equivalent for frost classification. Value range based on typical, well-graded soil curves.

** Very fine sand : greater than 50% of sand fraction passing the number 100 sieve

Pump Station 12 Force Main Improvements
Anchorage, Alaska

FROST CLASSIFICATION LEGEND

July 2020 32-1-20115-001

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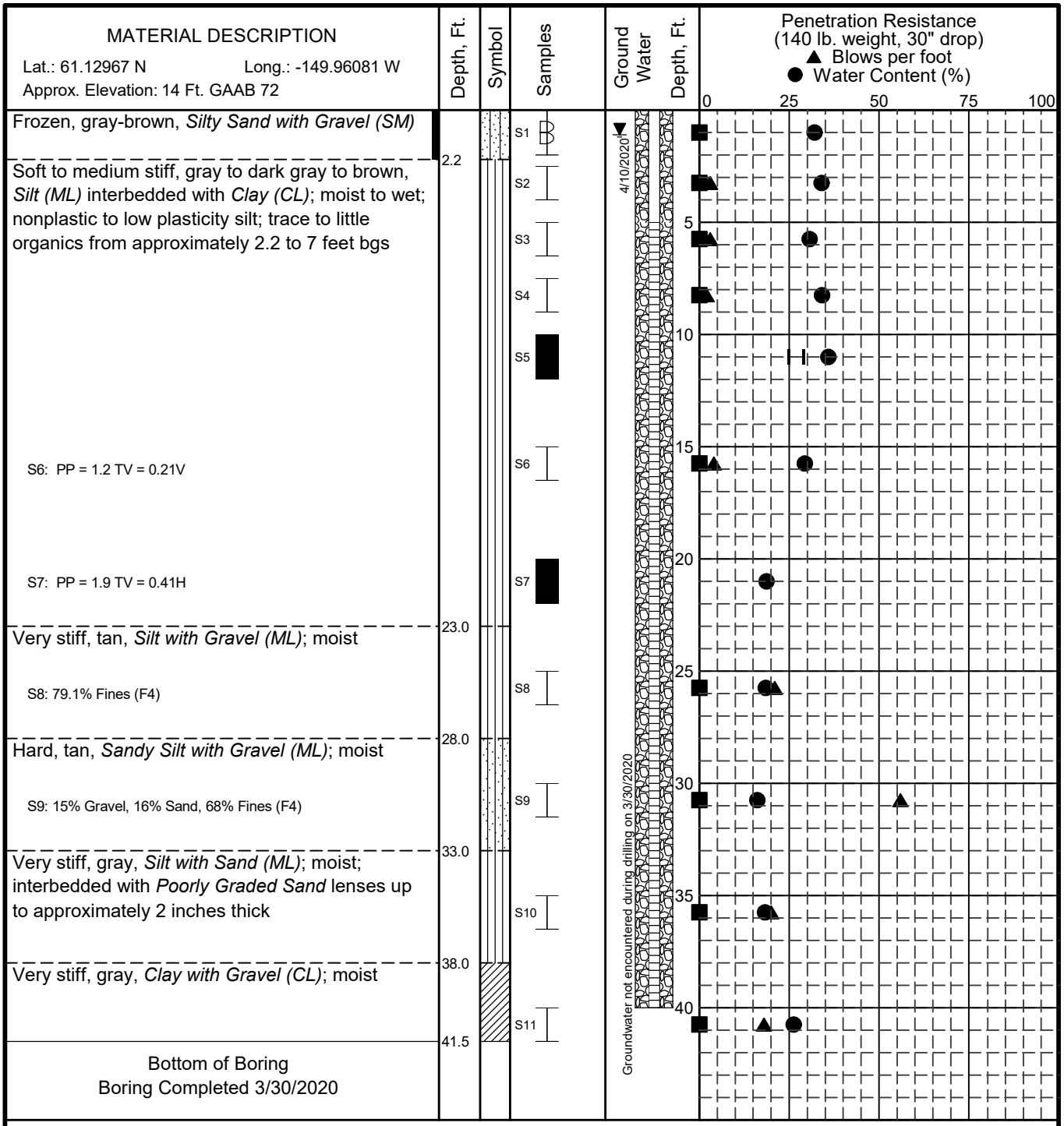
FIG. 4



LEGEND

- * Sample Not Recovered
- Grab Sample
- 2" O.D. Split Spoon Sample
- Shelby Tube
- Frozen
- Static Water Level
- Blank Section, Cuttings Backfill
- Slotted Section, Cuttings Backfill

NOTES

1. The stratification lines represent the approximate boundaries between soil types, and the transition may be gradual.
2. The discussion in the text of this report is necessary for a proper understanding of the nature of subsurface materials.
3. Water level, if indicated above, is for the date specified and may vary.
4. PP (Pocket Penetrometer) tests estimate Unconfined Compressive Strength of Cohesive Soils. TV (Torvane) tests estimate the Undrained Shear Strength of Cohesive Soils. All measurements in tons per square foot.

Pump Station 12 Force Main Improvements
Anchorage, Alaska

LOG OF BORING TB-1

July 2020 32-1-20115-001

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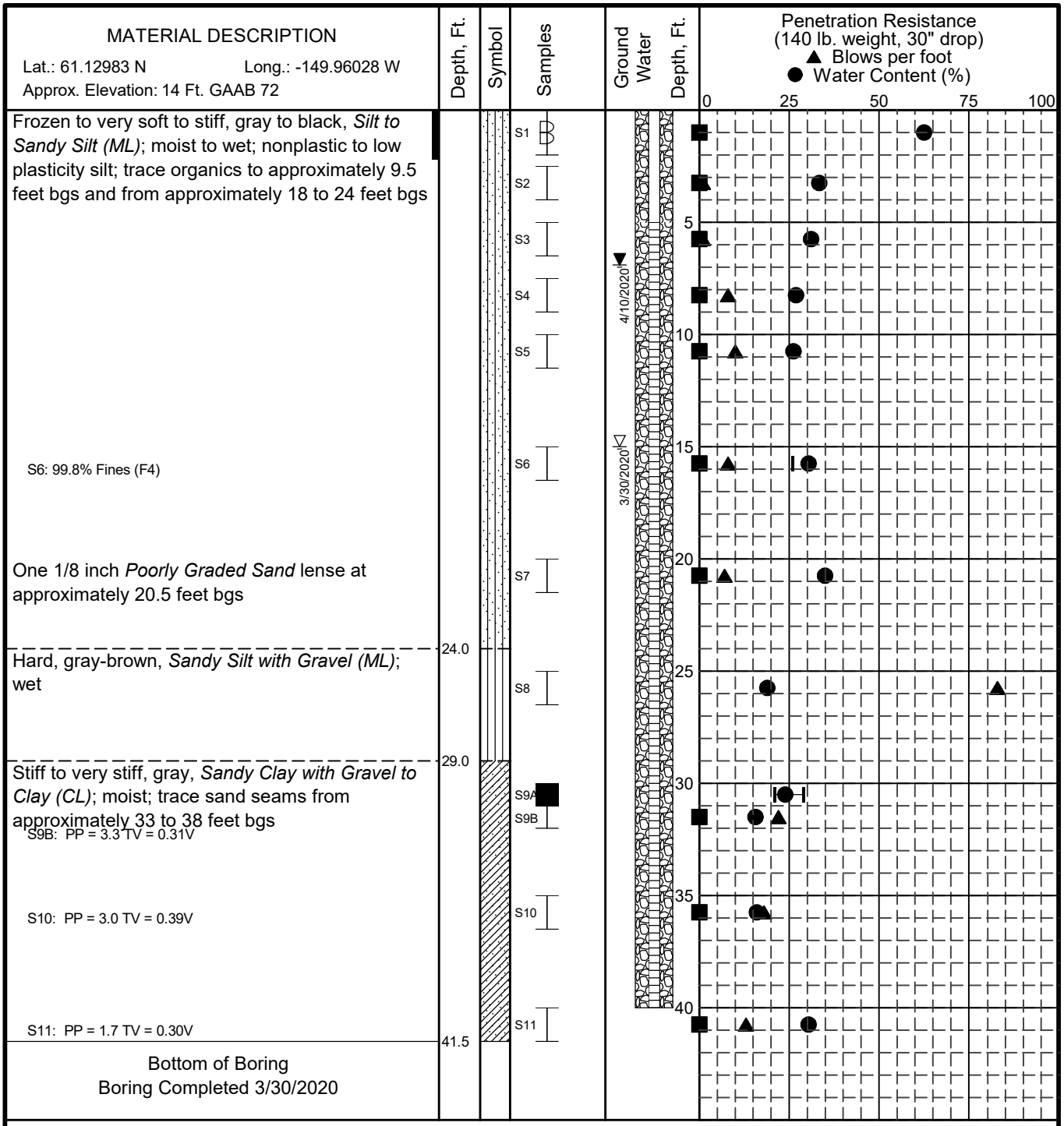
FIG. 5

GEOTECHNICAL LOG PS12 2020.GPJ S&W GEO1.GDT 7/17/20

REV 3 - Approved for Submittal



LEGEND

- * Sample Not Recovered
- Grab Sample
- 2" O.D. Split Spoon Sample
- Shelby Tube
- Frozen
- Ground Water Level At Time Of Drilling
- Static Water Level
- Blank Section, Cuttings Backfill
- Slotted Section, Cuttings Backfill

NOTES

1. The stratification lines represent the approximate boundaries between soil types, and the transition may be gradual.
2. The discussion in the text of this report is necessary for a proper understanding of the nature of subsurface materials.
3. Water level, if indicated above, is for the date specified and may vary.
4. PP (Pocket Penetrometer) tests estimate Unconfined Compressive Strength of Cohesive Soils. TV (Torvane) tests estimate the Undrained Shear Strength of Cohesive Soils. All measurements in tons per square foot.

Pump Station 12 Force Main Improvements
Anchorage, Alaska

LOG OF BORING TB-2

July 2020 32-1-20115-001

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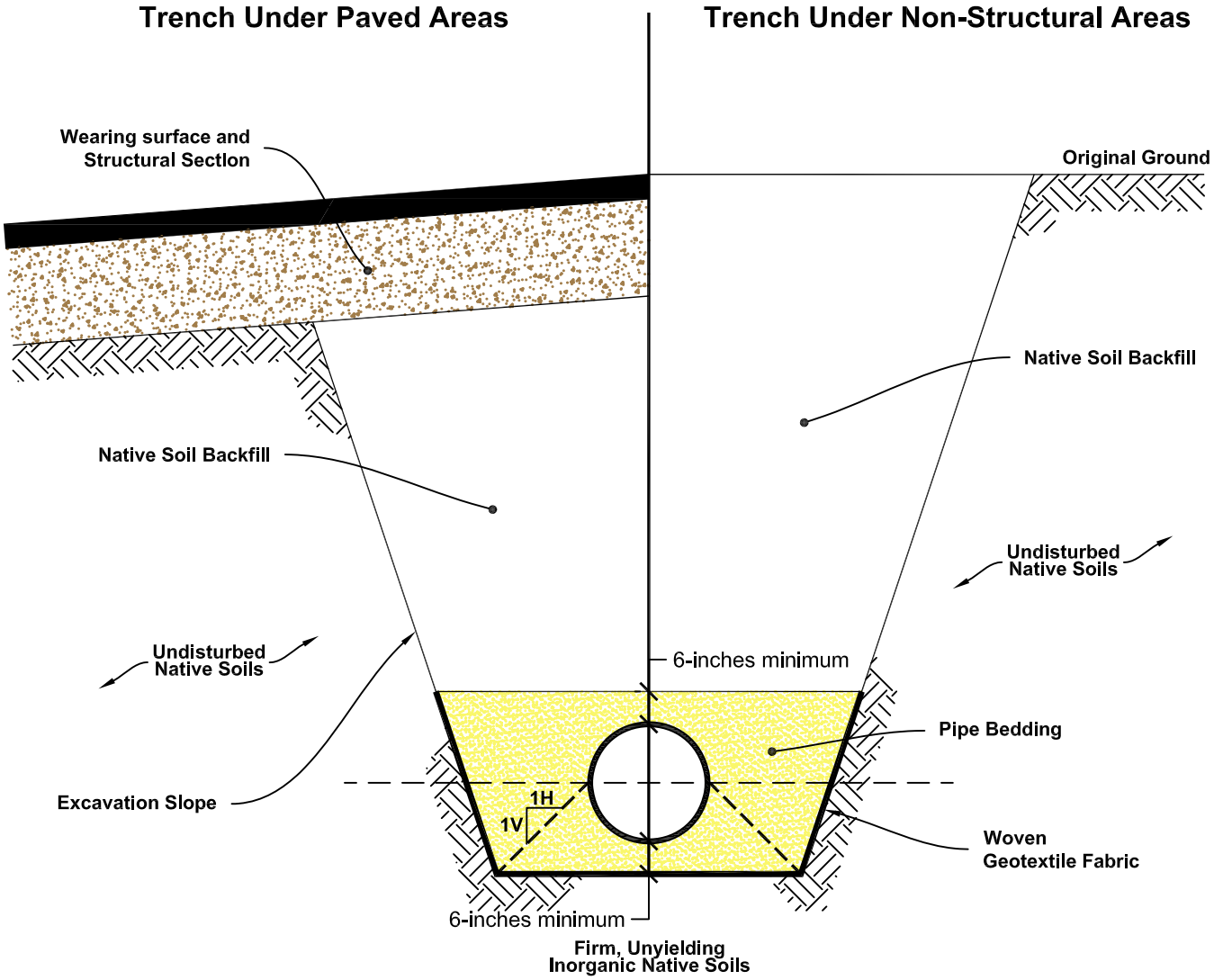
FIG. 6

GEOTECHNICAL LOG PS12 2020.GPJ S&W GEO1.GDT 7/17/20

REV 3 - Approved for Submittal



NOTES

1. Trench backfill under structural areas should be placed in loose lifts not to exceed 12 inches and compacted to at least 95 percent of its maximum dry density as determined by ASTM D-1557.
2. Trench backfill under non-structural areas should be placed in loose lifts not to exceed 18 inches and compacted to at least 90 percent of its maximum dry density as determined by ASTM D-1557.
3. Pipe bedding should conform to MOA Class E bedding material or as recommended by pipe manufacturer.
4. Pipe bedding and cover thickness shown above should be used absent pipe manufacturer requirements.
5. OSHA requires slope protection and support for all trenches greater than 4 feet deep. Side slope requirements are variable depending upon soil type and the duration of time in which the trench remains open. The contractor should be made responsible for compliance to these regulations as he/she is at the project on a day to day basis, is aware of the changing conditions, and has authority to direct work.

Pump Station 12 Force Main Improvements
Anchorage, Alaska

UTILITY TRENCH DETAIL

July 2020 32-1-20115-001

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FIG. 7

GRADATION REQUIREMENTS

(Adapted from Municipality of Anchorage Standard Specifications, 2015)

TYPE II BACKFILL

U.S. STANDARD SIEVE SIZE		PERCENT PASSING BY WEIGHT
8 in.	-	100
3 in.	75 mm	70 - 100
1-1/2 in.	37.5 mm	55 - 100
3/4 in.	19.0 mm	45 - 85
No. 4	4.75 mm	20 - 60
No. 10	2.00 mm	12 - 50
No. 40	0.425 mm	4 - 30
No. 200	0.075 mm	2 - 6*

TYPE IIA BACKFILL

U.S. STANDARD SIEVE SIZE		PERCENT PASSING BY WEIGHT
3 in.	75 mm	100
3/4 in.	19.0 mm	50 - 100
No. 4	4.75 mm	25 - 60
No. 10	2.00 mm	15 - 50
No. 40	0.425 mm	4 - 30
No. 200	0.075 mm	2 - 6**

CLASS E BEDDING

U.S. STANDARD SIEVE SIZE		PERCENT PASSING BY WEIGHT
1/2 in.	12.5 mm	100
3/8 in.	9.5 mm	100-80
No. 4	4.75 mm	20 - 75
No. 8	2.36 mm	12 - 60
No. 40	0.425 mm	2 - 30
No. 200	0.075 mm	0 - 6

* The fraction passing the No. 200 sieve shall not exceed 15 percent of the fraction passing the No. 4 sieve.

** The fraction passing the No. 200 sieve shall not exceed 20 percent of the fraction passing the No. 4 sieve.

Pump Station 12 Force Main Improvements
Anchorage, Alaska

GRADATION REQUIREMENTS

July 2020 32-1-20115-001

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FIG. 8

APPENDIX A: LABORATORY TEST RESULTS

Appendix A

Laboratory Test Results

CONTENTS

- Grain Size Classification
- Atterberg Limits Results
- Shelby Tube Classification (3 Sheets)

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Sample	Depth, Ft	Classification	LL	PL	PI	Cc	Cu
●	**TB-1 S9**	**30.0 - 31.5**	**Sandy Silt with Gravel (ML)**					

	Sample	Depth, Ft	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TB-1 S9**	**30.0 - 31.5**	**37.5**				**15**	**16**	**68**	

GRAIN SIZE CLASSIFICATION

Pump Station 12 Force Main Improvements
Anchorage, Alaska

July 2020

32-1-20115-001

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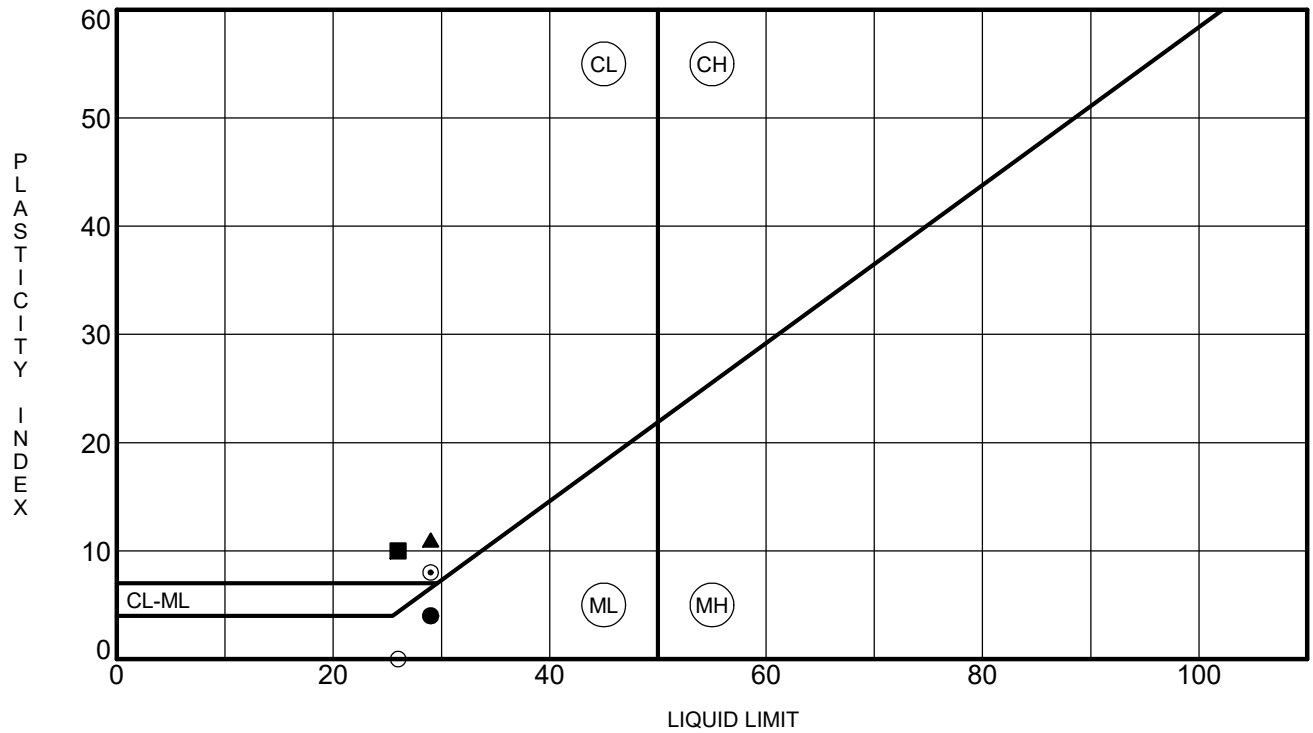
FIG. A-1



Boring		Depth, Ft	LL	PL	PI	Fines	Classification
●	**TB-1**	**10.0 - 12.0**	**29**	**25**	**4**		**Silt (ML)**
■	**TB-1**	**20.5 - 21.0**	**26**	**16**	**10**		**Clay (Cl)**
▲	**TB-1**	**21.5 - 22.0**	**29**	**18**	**11**		**Clay (CL)**
○	**TB-2**	**15.0 - 16.5**	**26**	**26**	**NP**		**Silt (ML)**
⊙	**TB-2**	**30.0 - 31.0**	**29**	**21**	**8**		**Clay (CL)**

Pump Station 12 Force Main Improvements
Anchorage, Alaska

ATTERBERG LIMITS RESULTS

July 2020 32-1-20115-001

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FIG. A-2

Classification of Shelby Tube Sample

Boring: TB-1 Sample: S5

Depth: 10 to 12 feet below ground surface
Sample Quality: Good to Fair

Depth (ft)	Length	Torvane V	Torvane H	Torvane R	Torvane S	Pocket Pen	M%	Description
10.0								Slough
10.5	0.5'	0.20	0.24	0.13	1.54	0.25	35.9	Gray, SILT (ML) to SILTY CLAY (CL-ML), wet
11.0	0.5'	0.27	0.26	0.18	1.50	0.75	32.7	Gray, SILT (ML) to SILTY CLAY (CL-ML), wet
11.5	0.5	0.20	0.20	0.21	0.95	0.25 - 0.5	37.0	Gray, SILT (ML) to SILTY CLAY (CL-ML), wet, rapidly dilatent
12.0								Bottom of Sample

NOTES

1. V, H, and R represent Vertical, Horizontal, and Remolded Torvane measurements, respectively.
2. Clay sensitivity is shown in the column labeled S and is a ratio of Tv to Tr.
3. Torvane and Pocket Pen results are reported in tons per square foot (tsf).
4. Reported Pocket Pen measurements are an average of the values representing each 6-inch section of the sample.
5. Moisture content for each interval is recorded in the column labeled M%.
6. -- Not Tested

Pump Station 12 Force Main Improvements
Anchorage, Alaska

SHELBY TUBE CLASSIFICATION
BORING TB-1 S5

July 2020 32-1-20115-001

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FIG. A-3
Sheet 1 of 3

CLASSIFICATION OF SHELBY TUBE SAMPLE

BORING: TB-I SAMPLE: S7

DEPTH: 20 TO 22 FEET BELOW GROUND SURFACE
SAMPLE QUALITY: GOOD

DEPTH (FT)	LENGTH	TORVANE V	TORVANE H	TORVANE R	TORVANE S	POCKET PEN	M%	DESCRIPTION
20.0								
								Slough
20.5	0.5'	0.35	0.45	0.20	1.75	0.75 - 1.5	29.2	Gray, SILT (ML), wet, dilatent, patches of organics
21.0	0.5'	1.0	1.2	0.65	1.54	1.25 - 1.5	19.0	Gray, CLAY (CL), moist
21.5	0.1							
	0.4	1.1	1.15	0.50	2.2	1.25 - 1.75	18.7	Gray to brown, CLAY (CL) with rust colored inclusions, moist
22.0								

Bottom of Sample

NOTES

1. V, H, and R represent Vertical, Horizontal, and Remolded Torvane measurements, respectively.
2. Clay sensitivity is shown in the column labeled S and is a ratio of Tv to Tr.
3. Torvane and Pocket Pen results are reported in tons per square foot (tsf).
4. Reported Pocket Pen measurements are an average of the values representing each 6-inch section of the sample.
5. Moisture content for each interval is recorded in the column labeled M%.
6. -- Not Tested

Pump Station 12 Force Main Improvements
Anchorage, Alaska

SHELBY TUBE CLASSIFICATION
BORING TB-1 S7

July 2020 32-1-20115-001

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FIG. A-3
Sheet 2 of 3

CLASSIFICATION OF SHELBY TUBE SAMPLE

BORING: TB-2 SAMPLE: S9A

DEPTH: 30 TO 31 FEET BELOW GROUND SURFACE
SAMPLE QUALITY: FAIR TO POOR

DEPTH (FT)	TORVANE				POCKET PEN	M%	DESCRIPTION
	LENGTH	V	H	R	S			
								Slough
30.0	0.5'	0.50	0.45	0.35	1.43	2.75 - 3.75	21.2	Gray, CLAY with Gravel (CL) to SILTY CLAY with Gravel (CL-ML), dry
30.5	0.4'	0.57	0.61	0.45	1.27	1.75 - 4.0	20.8 - 23.9	Gray, CLAY with Gravel (CL) to SILTY CLAY with Gravel (CL-ML), dry, interbedded gravel layers with gravels up to 2-inch diameter
31.0								Bottom of Sample

NOTES

1. V, H, and R represent Vertical, Horizontal, and Remolded Torvane measurements, respectively.
2. Clay sensitivity is shown in the column labeled S and is a ratio of Tv to Tr.
3. Torvane and Pocket Pen results are reported in tons per square foot (tsf).
4. Reported Pocket Pen measurements are an average of the values representing each 6-inch section of the sample.
5. Moisture content for each interval is recorded in the column labeled M%.
6. -- Not Tested

Pump Station 12 Force Main Improvements
Anchorage, Alaska

SHELBY TUBE CLASSIFICATION
BORING TB-2 S9A

July 2020 32-1-20115-001

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FIG. A-3
Sheet 3 of 3

IMPORTANT INFORMATION

Important Information

About Your Geotechnical/Environmental Report

IMPORTANT INFORMATION

CONSULTING SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND FOR SPECIFIC CLIENTS.

Consultants prepare reports to meet the specific needs of specific individuals. A report prepared for a civil engineer may not be adequate for a construction contractor or even another civil engineer. Unless indicated otherwise, your consultant prepared your report expressly for you and expressly for the purposes you indicated. No one other than you should apply this report for its intended purpose without first conferring with the consultant. No party should apply this report for any purpose other than that originally contemplated without first conferring with the consultant.

THE CONSULTANT'S REPORT IS BASED ON PROJECT-SPECIFIC FACTORS.

A geotechnical/environmental report is based on a subsurface exploration plan designed to consider a unique set of project-specific factors. Depending on the project, these may include the general nature of the structure and property involved; its size and configuration; its historical use and practice; the location of the structure on the site and its orientation; other improvements such as access roads, parking lots, and underground utilities; and the additional risk created by scope-of-service limitations imposed by the client. To help avoid costly problems, ask the consultant to evaluate how any factors that change subsequent to the date of the report may affect the recommendations. Unless your consultant indicates otherwise, your report should not be used (1) when the nature of the proposed project is changed (for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one, or chemicals are discovered on or near the site); (2) when the size, elevation, or configuration of the proposed project is altered; (3) when the location or orientation of the proposed project is modified; (4) when there is a change of ownership; or (5) for application to an adjacent site. Consultants cannot accept responsibility for problems that may occur if they are not consulted after factors that were considered in the development of the report have changed.

SUBSURFACE CONDITIONS CAN CHANGE.

Subsurface conditions may be affected as a result of natural processes or human activity. Because a geotechnical/environmental report is based on conditions that existed at the time of subsurface exploration, construction decisions should not be based on a report whose adequacy may have been affected by time. Ask the consultant to advise if additional tests are desirable before construction starts; for example, groundwater conditions commonly vary seasonally.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes, or groundwater fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of a geotechnical/environmental report. The consultant should be kept apprised of any such events and should be consulted to determine if additional tests are necessary.

MOST RECOMMENDATIONS ARE PROFESSIONAL JUDGMENTS.

Site exploration and testing identifies actual surface and subsurface conditions only at those points where samples are taken. The data were extrapolated by your consultant, who then applied judgment to render an opinion about overall subsurface conditions. The actual interface between materials may be far more gradual or abrupt than your report indicates. Actual conditions in areas not sampled may differ from those predicted in your report. While nothing can be done to prevent such situations, you and your consultant can work together to help reduce their impacts. Retaining

IMPORTANT INFORMATION

your consultant to observe subsurface construction operations can be particularly beneficial in this respect.

A REPORT'S CONCLUSIONS ARE PRELIMINARY.

The conclusions contained in your consultant's report are preliminary, because they must be based on the assumption that conditions revealed through selective exploratory sampling are indicative of actual conditions throughout a site. Actual subsurface conditions can be discerned only during earthwork; therefore, you should retain your consultant to observe actual conditions and to provide conclusions. Only the consultant who prepared the report is fully familiar with the background information needed to determine whether or not the report's recommendations based on those conclusions are valid and whether or not the contractor is abiding by applicable recommendations. The consultant who developed your report cannot assume responsibility or liability for the adequacy of the report's recommendations if another party is retained to observe construction.

THE CONSULTANT'S REPORT IS SUBJECT TO MISINTERPRETATION.

Costly problems can occur when other design professionals develop their plans based on misinterpretation of a geotechnical/environmental report. To help avoid these problems, the consultant should be retained to work with other project design professionals to explain relevant geotechnical, geological, hydrogeological, and environmental findings, and to review the adequacy of their plans and specifications relative to these issues.

BORING LOGS AND/OR MONITORING WELL DATA SHOULD NOT BE SEPARATED FROM THE REPORT.

Final boring logs developed by the consultant are based upon interpretation of field logs (assembled by site personnel), field test results, and laboratory and/or office evaluation of field samples and data. Only final boring logs and data are customarily included in geotechnical/environmental reports. These final logs should not, under any circumstances, be redrawn for inclusion in architectural or other design drawings, because drafters may commit errors or omissions in the transfer process.

To reduce the likelihood of boring log or monitoring well misinterpretation, contractors should be given ready access to the complete geotechnical engineering/environmental report prepared or authorized for their use. If access is provided only to the report prepared for you, you should advise contractors of the report's limitations, assuming that a contractor was not one of the specific persons for whom the report was prepared, and that developing construction cost estimates was not one of the specific purposes for which it was prepared. While a contractor may gain important knowledge from a report prepared for another party, the contractor should discuss the report with your consultant and perform the additional or alternative work believed necessary to obtain the data specifically appropriate for construction cost estimating purposes. Some clients hold the mistaken impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems and the adversarial attitudes that aggravate them to a disproportionate scale.

READ RESPONSIBILITY CLAUSES CLOSELY.

Because geotechnical/environmental engineering is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims

being lodged against consultants. To help prevent this problem, consultants have developed a number of clauses for use in their contracts, reports, and other documents. These responsibility clauses are not exculpatory clauses designed to transfer the consultant's liabilities to other parties; rather, they are definitive clauses that identify where the consultant's responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your report, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to your questions.

The preceding paragraphs are based on information provided by the ASFE/Association of Engineering Firms Practicing in the Geosciences, Silver Spring, Maryland

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 SEWER IMPROVEMENTS

PUMP STATION 12 FORCE MAIN / INTERCEPTOR C GRAVITY JUNCTION REHABILITATION

SECTION XIII

CLOSED CIRCUIT TELEVISION INSPECTIONS (CCTV)

48" RCP - MH10 to Gravity Junction

Frawner Corp.
8123 Hartzel Rd
Anchorage, AK 99507

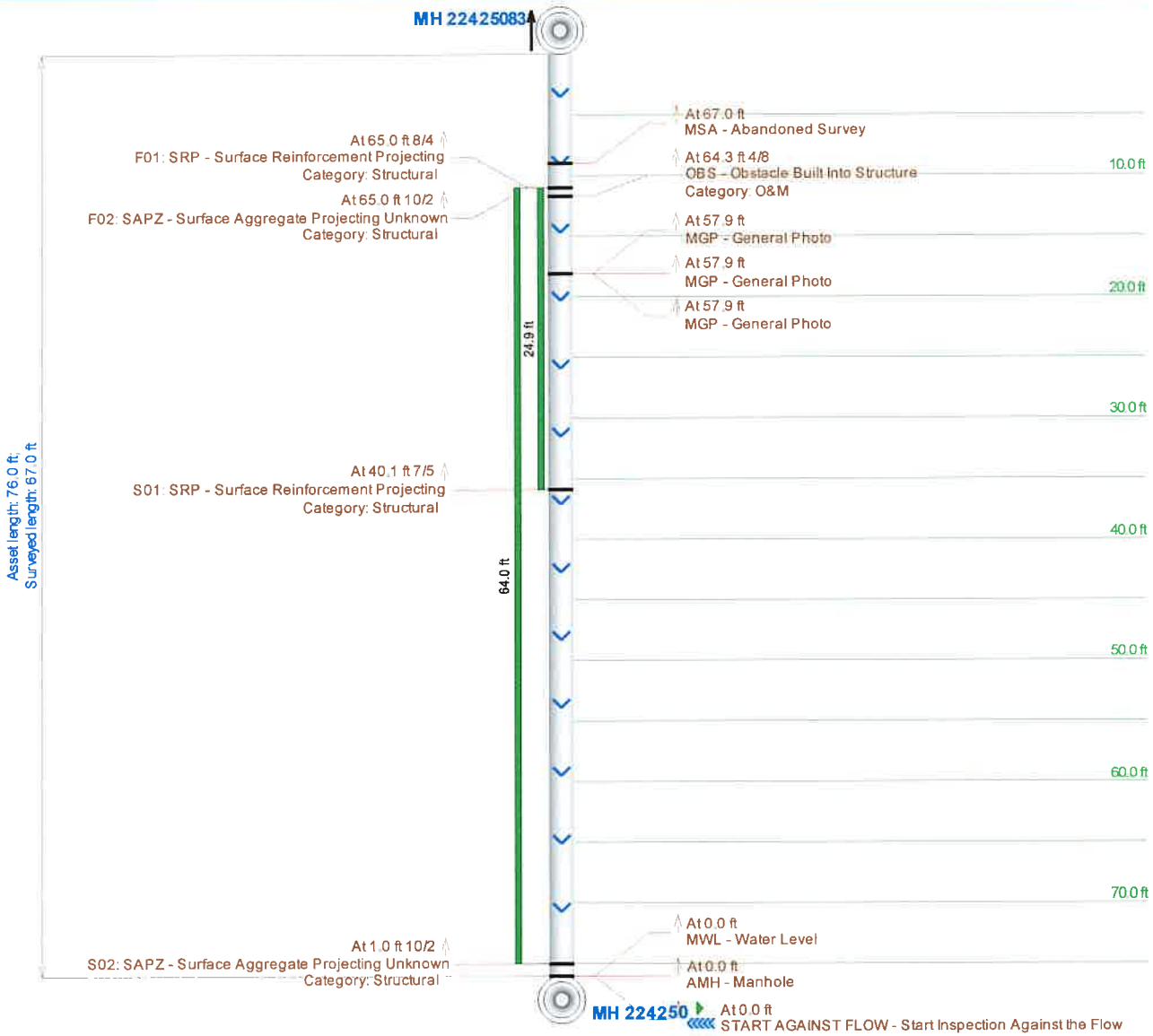
GRANITE XP
Pipeline Inspection and Integration Software

Main Inspection with Pipe-Run Graph

Project Name:	Pipeline segment ref:	City:	Street:
PS 12 rehab	SP 22425083224245010	Anchorage	Dimond blvd

Start date/time:	Width:	Height:	Material:	Location code:	Weather:
07/18/2018		48	DIP	C	

Direction:	Length surveyed:	Surveyed by:	Additional info:
UPSTREAM	67.0	Charles LaBadie	



20" DIP - Gravity Junction to Strathmore / Dimond

Frawner Corp.
8123 Hartzel Rd
Anchorage, AK 99507

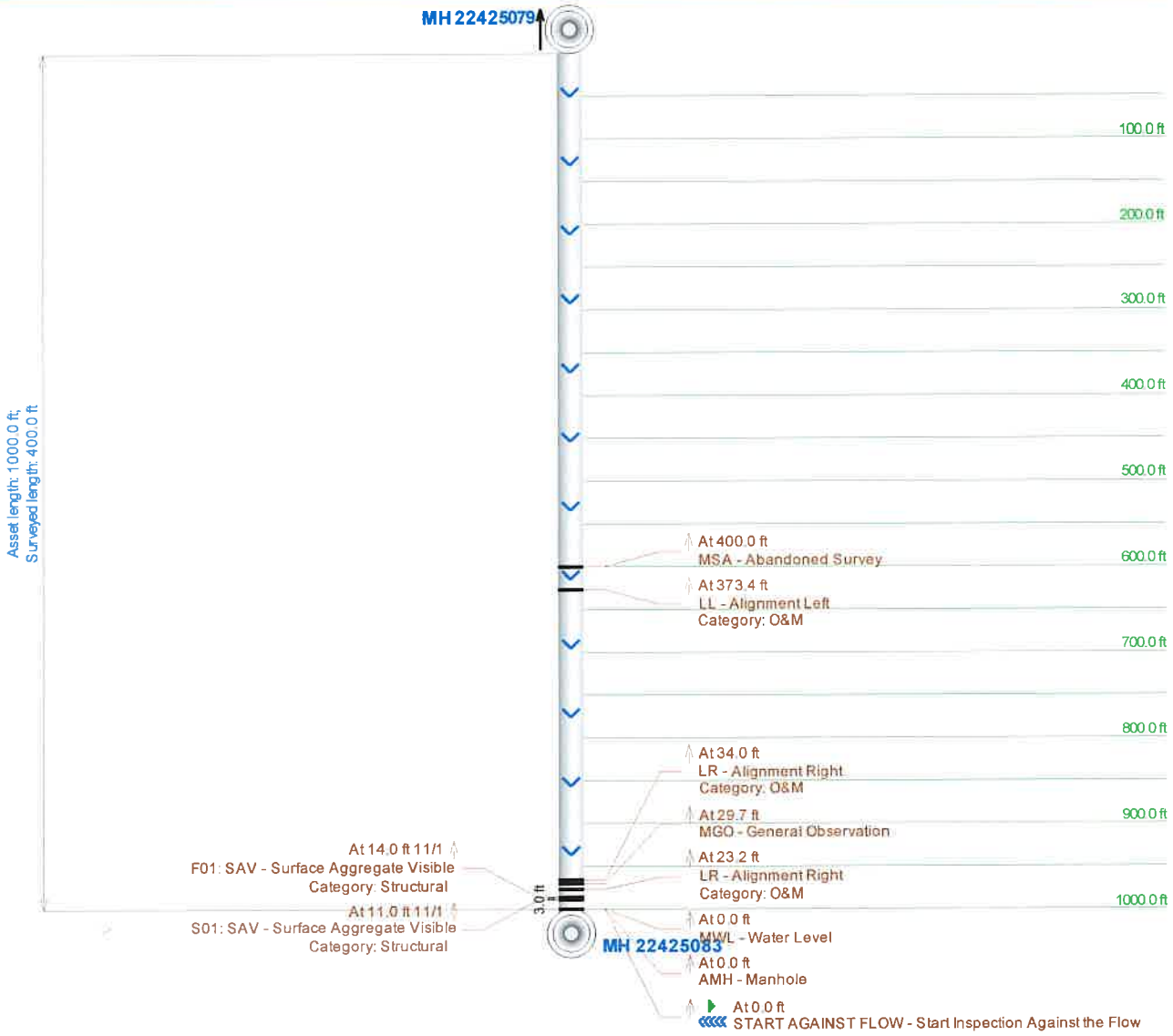
GRANITE XP
Pipeline Inspection and Integration Software

Main Inspection with Pipe-Run Graph

Project Name:	Pipeline segment ref:	City:	Street:
PS 12 rehab	SP 2242507922425083	Anchorage	Dimond

Start date/time:	Width:	Height:	Material:	Location code:	Weather:
07/17/2018		20	DIP		

Direction:	Length surveyed:	Surveyed by:	Additional info:
UPSTREAM	400.0	Charles LaBadie	



Abandoned Survey

Frawner Corp.
8123 Hartzel Rd
Anchorage, AK 99507

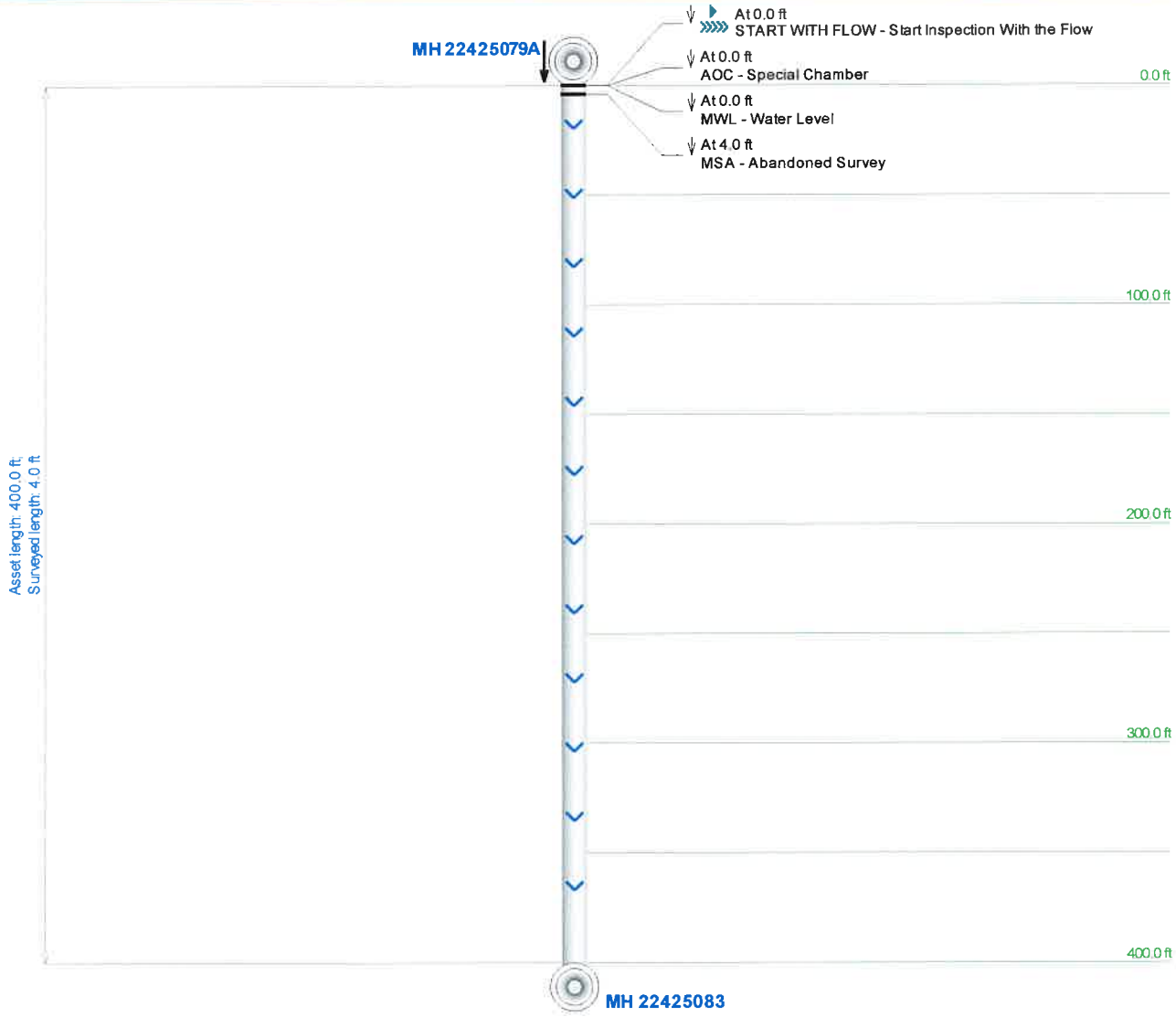
GRANITE XP
Pipeline Inspection and Integration Software

Main Inspection with Pipe-Run Graph

Project Name:	Pipeline segment ref:	City:	Street:
PS 12 rehab	SP 22425079A22425083	Anchorage	Dimond blvd

Start date/time:	Width:	Height:	Material:	Location code:	Weather:
07/18/2018		24	DIP		

Direction:	Length surveyed:	Surveyed by:	Additional info:
Downstream	4.0	Charles LaBadie	



24" DIP - Gravity Junction to Strathmore / Dimond

Frawner Corp.
8123 Hartzel Rd
Anchorage, AK 99507

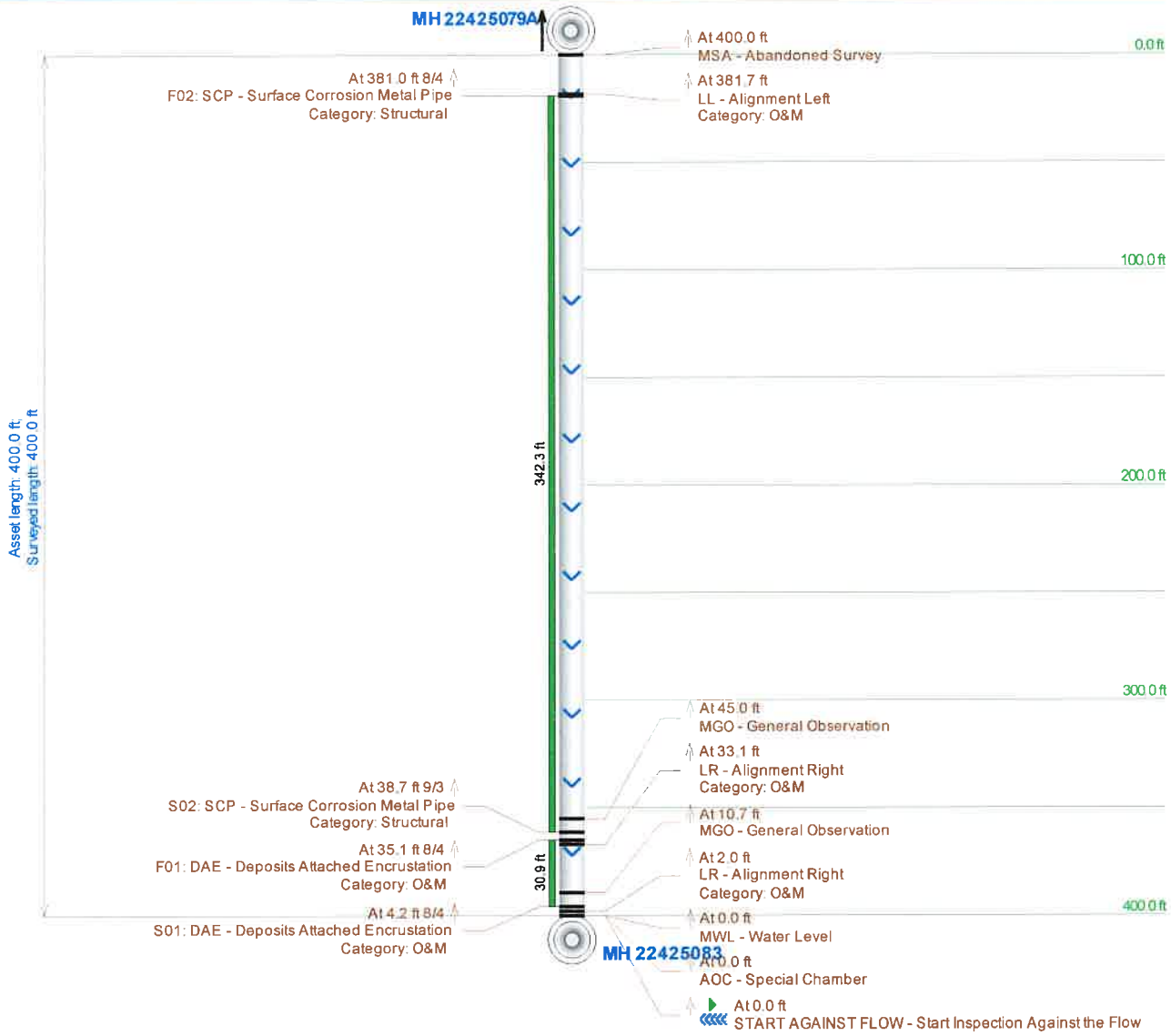
GRANITE XP
Pipeline Inspection and Integration Software

Main Inspection with Pipe-Run Graph

Project Name:	Pipeline segment ref:	City:	Street:
PS 12 rehab	SP 22425079A22425083	Anchorage	Dimond blvd

Start date/time:	Width:	Height:	Material:	Location code:	Weather:
07/18/2018		24	DIP		

Direction:	Length surveyed:	Surveyed by:	Additional info:
UPSTREAM	400.0	Charles LaBadie	



20" DIP - MH79 to Strathmore / Dimond

Frawner Corp.
8123 Hartzel Rd
Anchorage, AK 99507

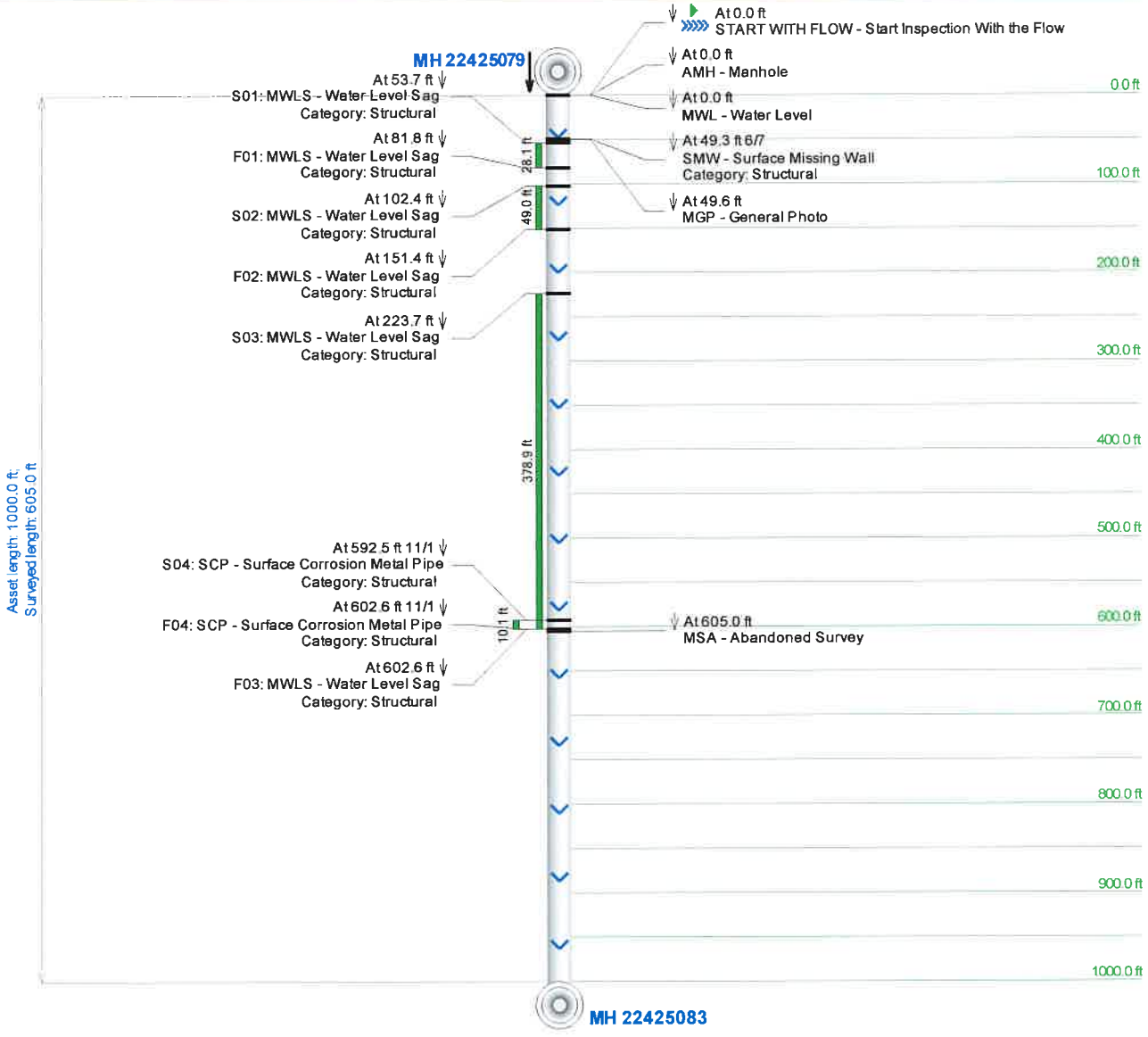
GRANITE XP
Pipeline Inspection and Integration Software

Main Inspection with Pipe-Run Graph

Project Name:	Pipeline segment ref:	City:	Street:
PS 12 rehab	SP 2242507922425083	Anchorage	Dimond

Start date/time:	Width:	Height:	Material:	Location code:	Weather:
07/20/2018		20	DIP		

Direction:	Length surveyed:	Surveyed by:	Additional info:
Downstream	605.0	Charles LaBadie	



20" DIP - MH79 towards MH78

Frawner Corp.
8123 Hartzel Rd
Anchorage, AK 99507

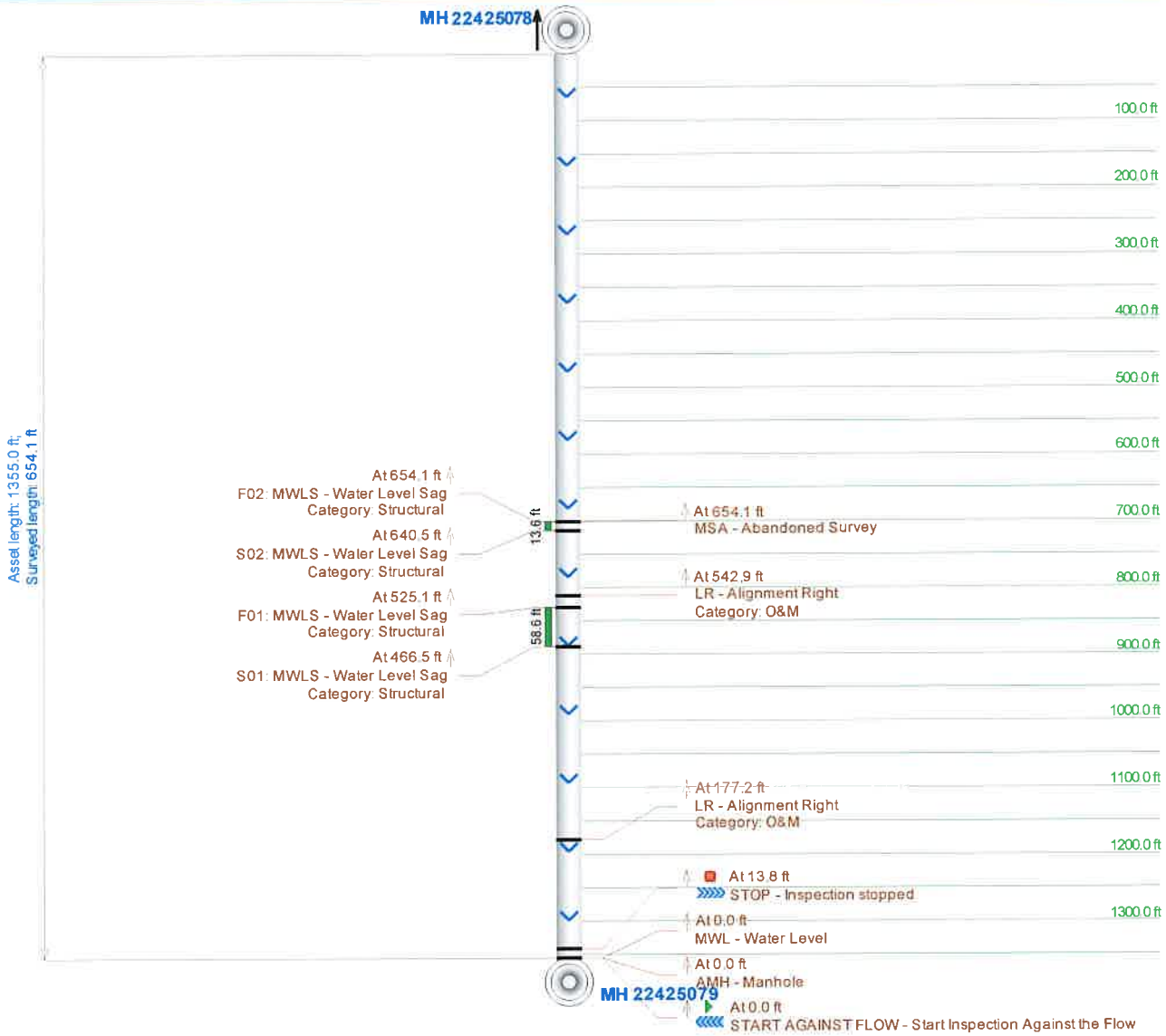
GRANITE XP
Pipeline Inspection and Integration Software

Main Inspection with Pipe-Run Graph

Project Name:	Pipeline segment ref:	City:	Street:
PS 12 rehab	SP 2242507822425079	Anchorage	Stathmore

Start date/time:	Width:	Height:	Material:	Location code:	Weather:
07/21/2018		20	DIP		

Direction:	Length surveyed:	Surveyed by:	Additional info:
UPSTREAM	654.1	Charles LaBadie	



20" DIP - MH78 towards MH79

Frawner Corp.
8123 Hartzell Rd
Anchorage, AK 99507
907-561-4044

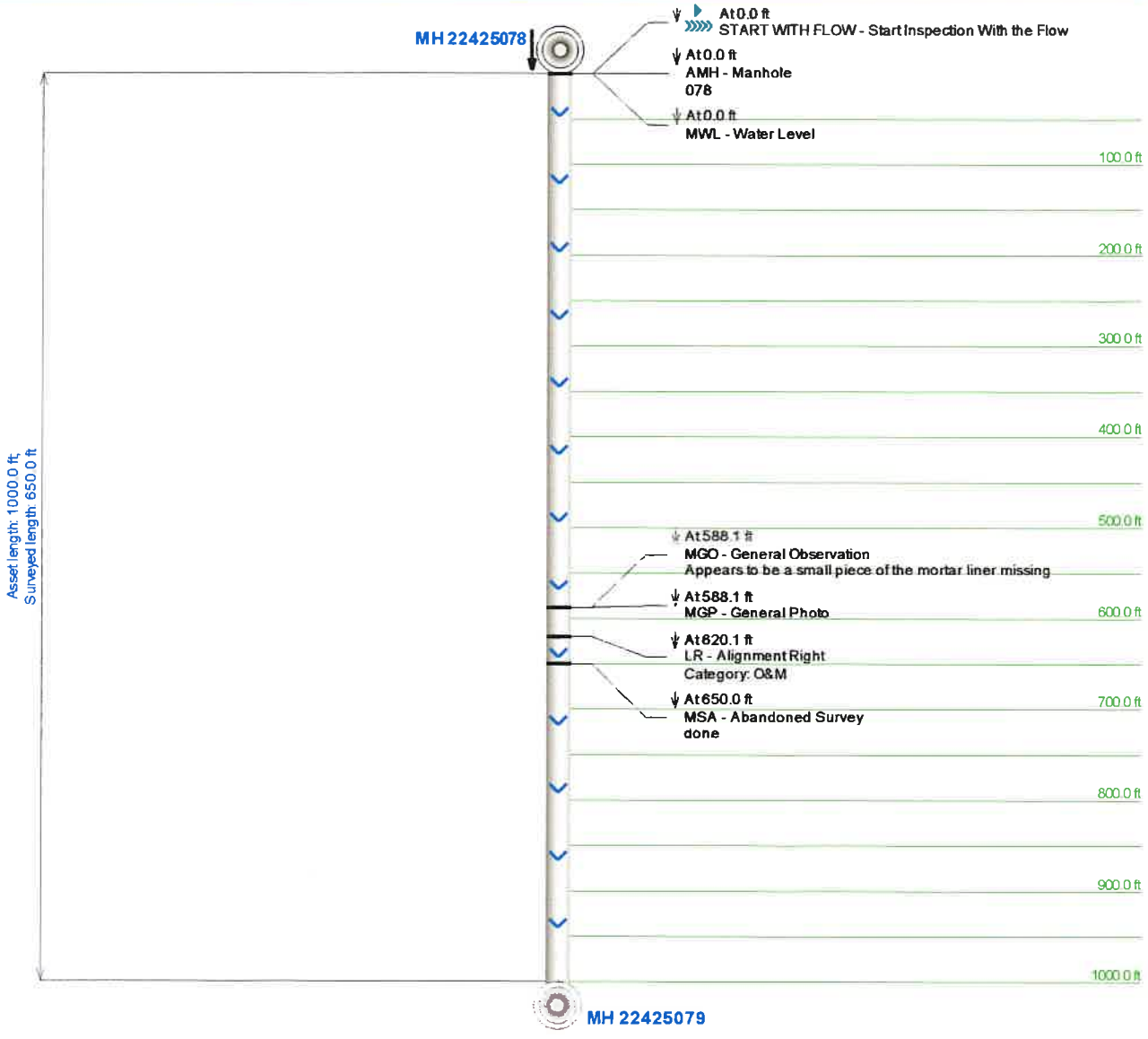
GRANITE XP
Pipeline Inspection and Integration Software

Main Inspection with Pipe-Run Graph

Project Name:	Pipeline segment ref:	City:	Street:
PS 12	SP 2242507822425079	Anchorage	Strathmore dr

Start date/time:	Width:	Height:	Material:	Location code:	Weather:
7/25/2018		20	DIP		

Direction:	Length surveyed:	Surveyed by:	Additional info:
Downstream	650.0	Charles LaBadie	



20" DIP - MH78 towards New MH77

Frawner Corp.
8123 Hartzell Rd
Anchorage, AK 99507
907-561-4044

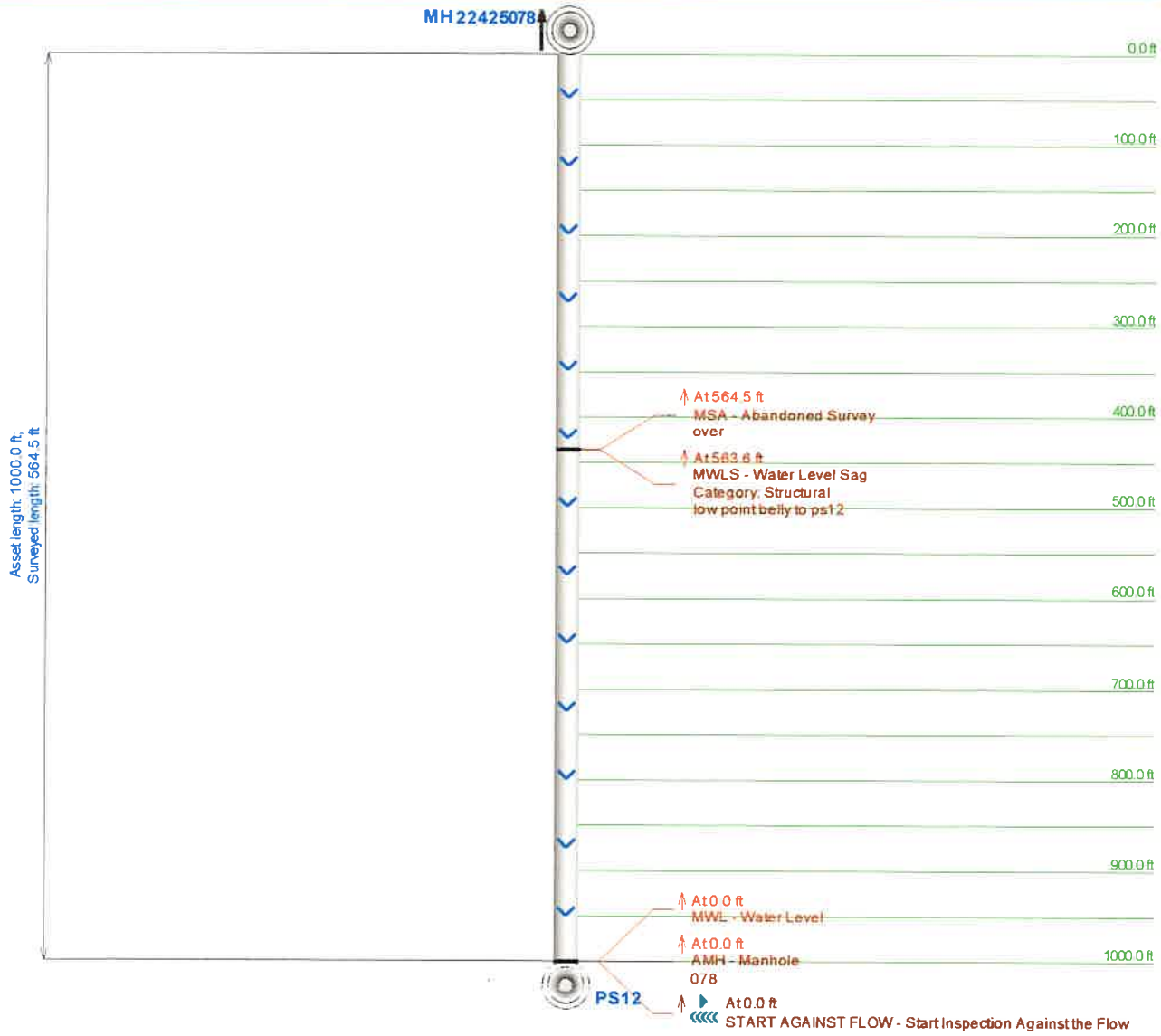
GRANITE XP
Pipeline Inspection and Integration Software

Main Inspection with Pipe-Run Graph

Project Name:	Pipeline segment ref:	City:	Street:
PS 12	MH 22425078-PS12	Anchorage	Lennox ave

Start date/time:	Width:	Height:	Material:	Location code:	Weather:
7/25/2018		20	DIP		

Direction:	Length surveyed:	Surveyed by:	Additional info:
UPSTREAM	564.5	Charles LaBadie	



Frawner Corp.
8123 Hartzel Rd
Anchorage, AK 99507

Abandoned Survey

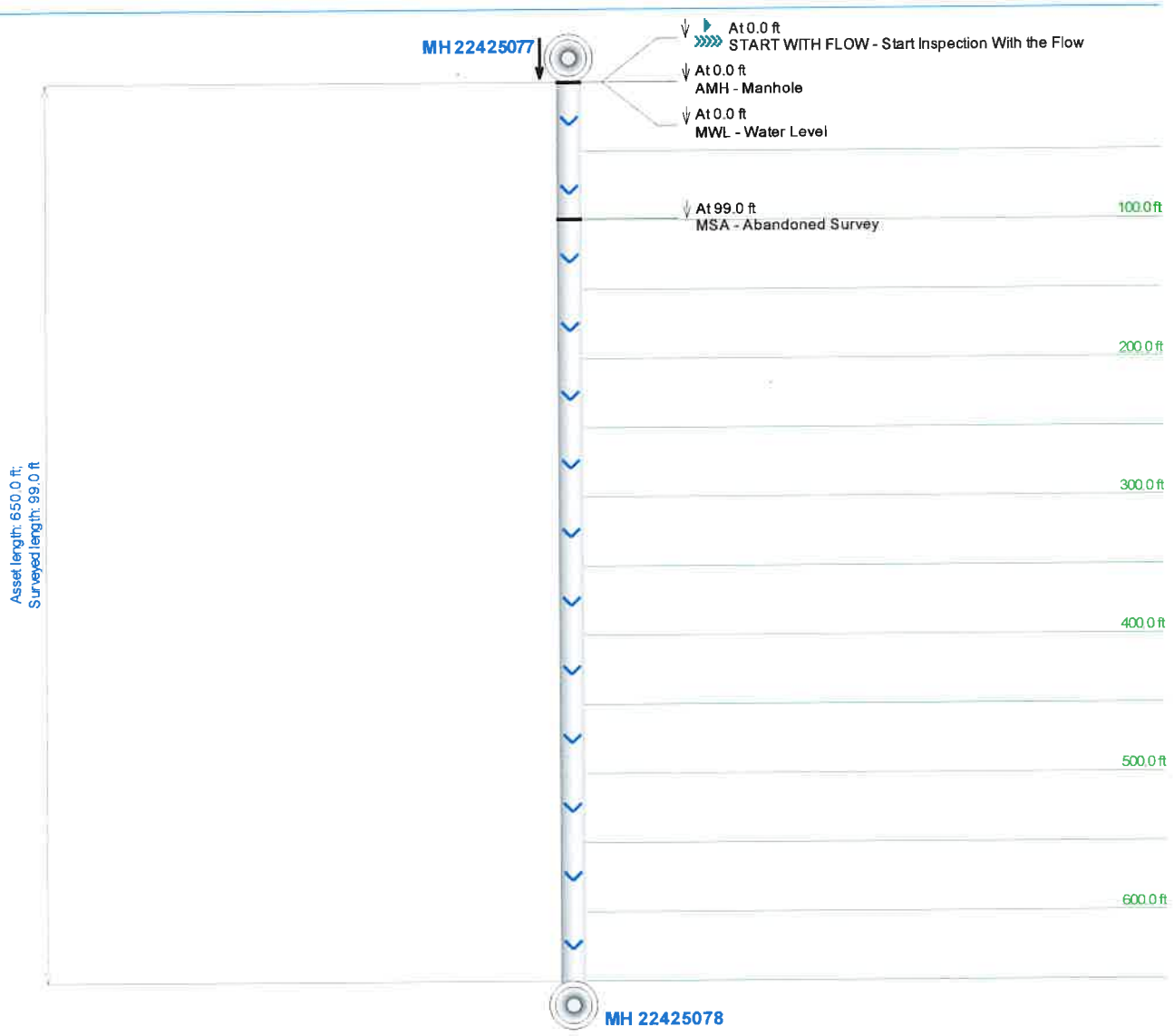
GRANITE XP
Pipeline Inspection and Integration Software

Main Inspection with Pipe-Run Graph

Project Name:	Pipeline segment ref:	City:	Street:
PS 12 rehab	SP 2242507722425078	Anchorage	100th ave

Start date/time:	Width:	Height:	Material:	Location code:	Weather:
01/30/2019		20	DIP		

Direction:	Length surveyed:	Surveyed by:	Additional info:
Downstream	99.0	Charles LaBadie	C



Frawner Corp.
8123 Hartzel Rd
Anchorage, AK 99507

Abandoned Survey

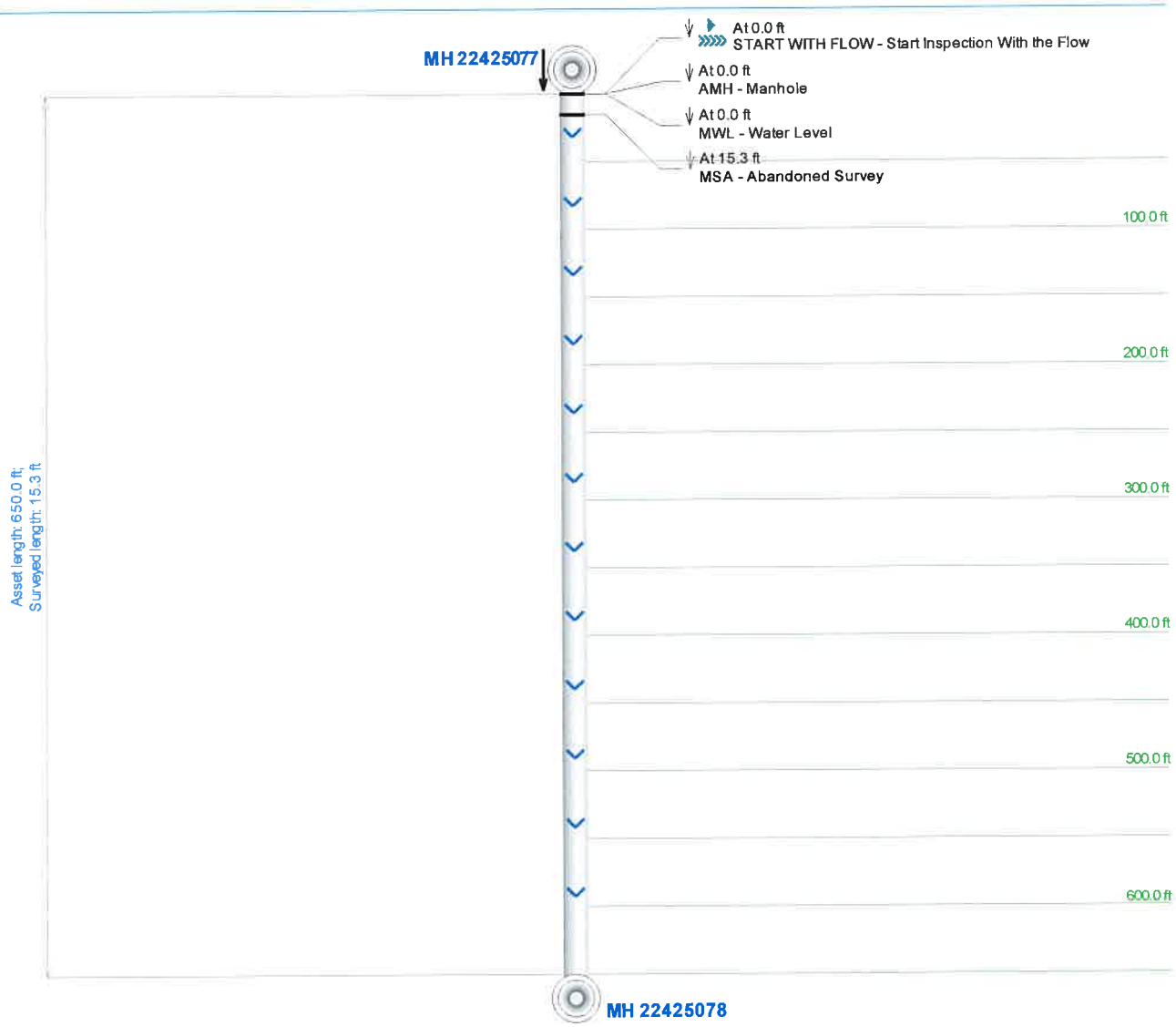
GRANITE XP
Pipeline Inspection and Integration Software

Main Inspection with Pipe-Run Graph

Project Name:	Pipeline segment ref:	City:	Street:
PS 12 rehab	SP 2242507722425078	Anchorage	100th ave

Start date/time:	Width:	Height:	Material:	Location code:	Weather:
01/30/2019		20	DIP		

Direction:	Length surveyed:	Surveyed by:	Additional info:
Downstream	15.3	Charles LaBadie	



20" DIP - New MH77 towards MH78

Frawner Corp.
8123 Hartzel Rd
Anchorage, AK 99507

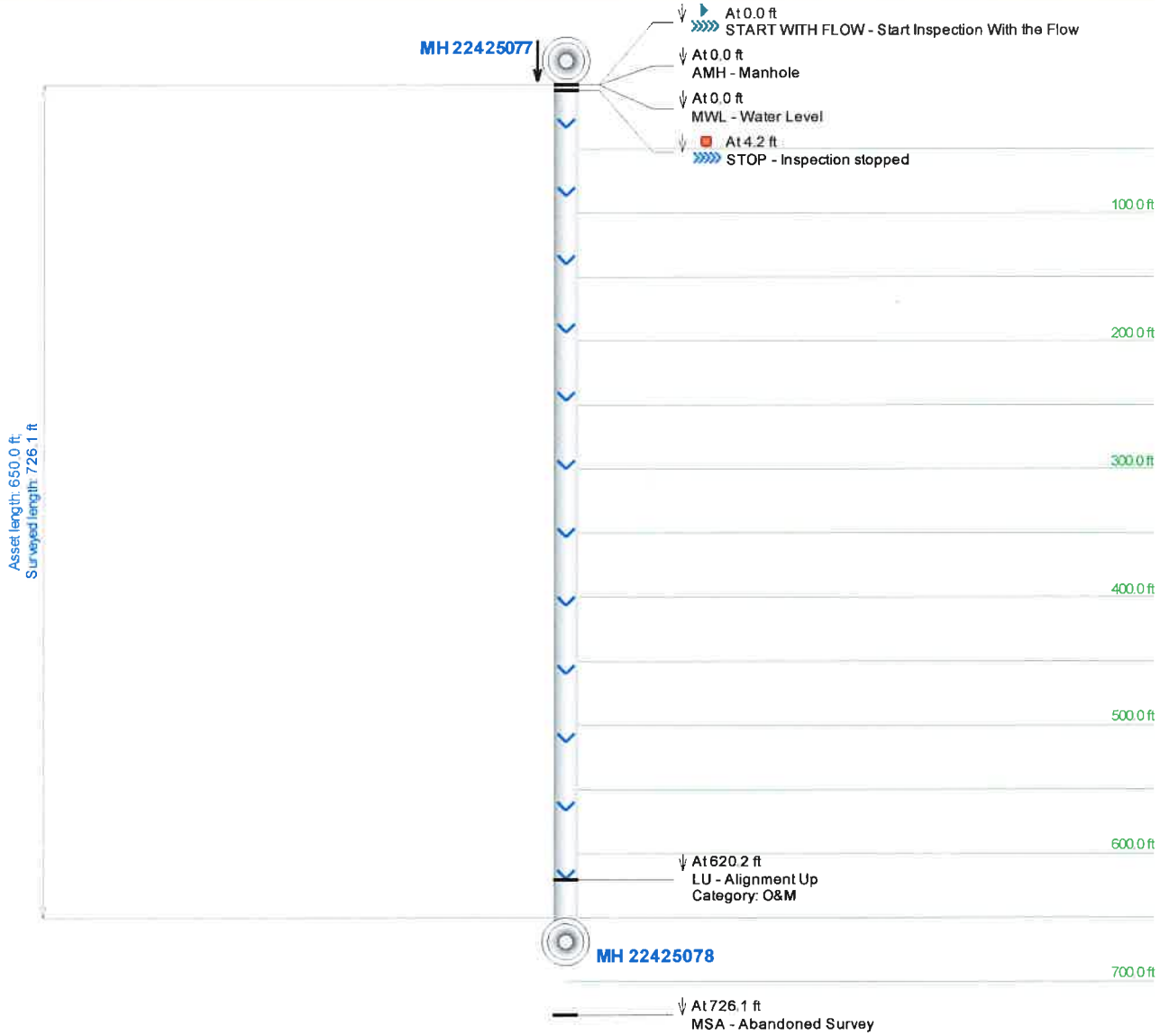
GRANITE XP
Pipeline Inspection and Integration Software

Main Inspection with Pipe-Run Graph

Project Name:	Pipeline segment ref:	City:	Street:
PS 12 rehab	SP 2242507722425078	Anchorage	100th ave

Start date/time:	Width:	Height:	Material:	Location code:	Weather:
01/30/2019		20	DIP		

Direction:	Length surveyed:	Surveyed by:	Additional info:
Downstream	726.1	Charles LaBadie	



24" DIP - New MH77A towards Proposed MH78A

Frawner Corp.
8123 Hartzel Rd
Anchorage, AK 99507

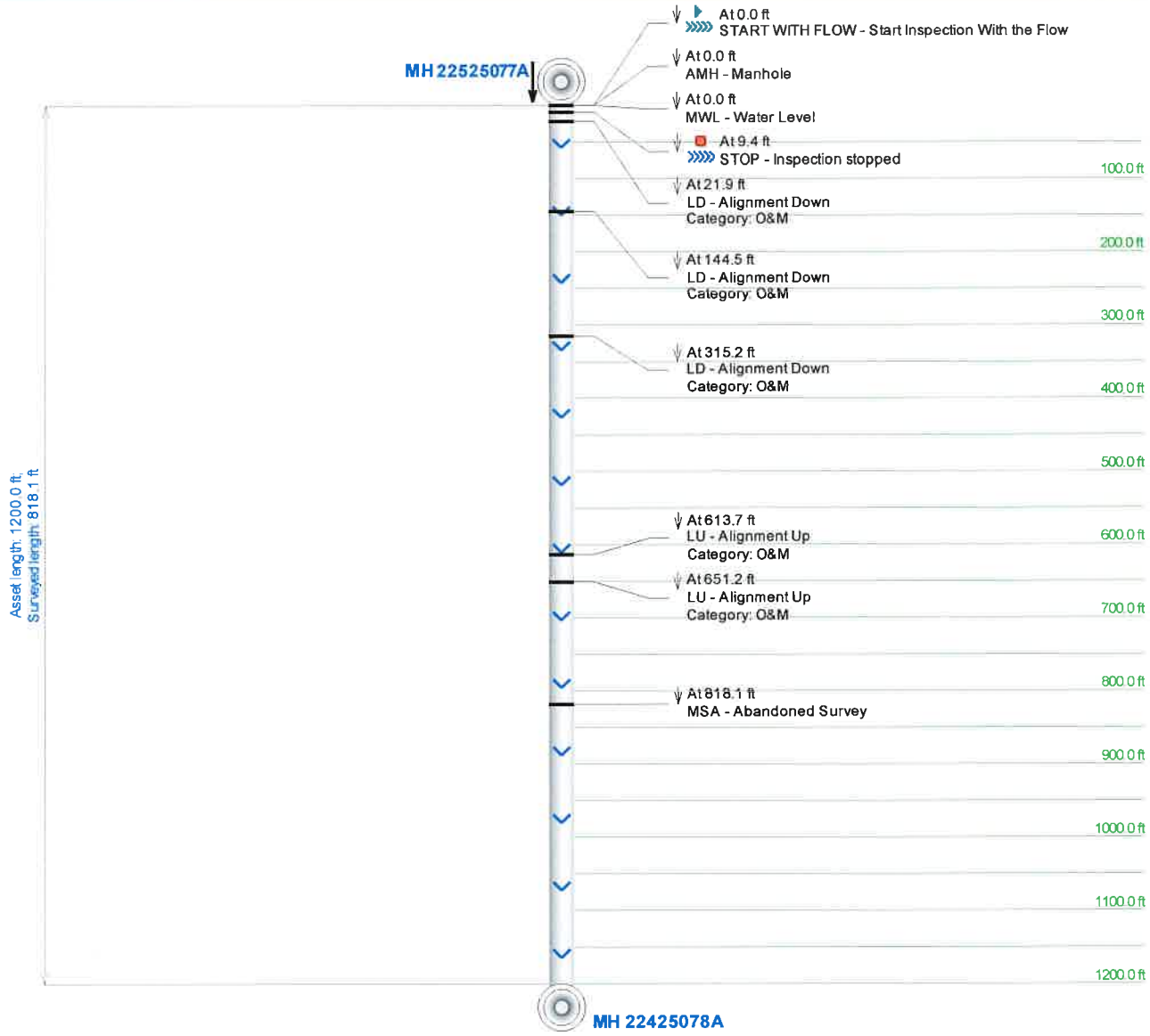
GRANITE XP
Pipeline Inspection and Integration Software

Main Inspection with Pipe-Run Graph

Project Name:	Pipeline segment ref:	City:	Street:
PS 12 rehab	SP 22525077A22425078A	aNCHORAGE	100TH

Start date/time:	Width:	Height:	Material:	Location code:	Weather:
02/06/2019		24	DIP		

Direction:	Length surveyed:	Surveyed by:	Additional info:
Downstream	818.1	Charles LaBadie	



24" DIP - New MH77A towards PS12

Frawner Corp.
8123 Hartzel Rd
Anchorage, AK 99507

Main Inspection with Pipe-Run Graph

Project Name:	Pipeline segment ref:	City:	Street:
PS 12 rehab	PS 12A-MH 22425077A	Anchorage	100th ave

Start date/time:	Width:	Height:	Material:	Location code:	Weather:
02/06/2019		24	DIP		

Direction:	Length surveyed:	Surveyed by:	Additional info:
UPSTREAM	253.9	Charles LaBadie	

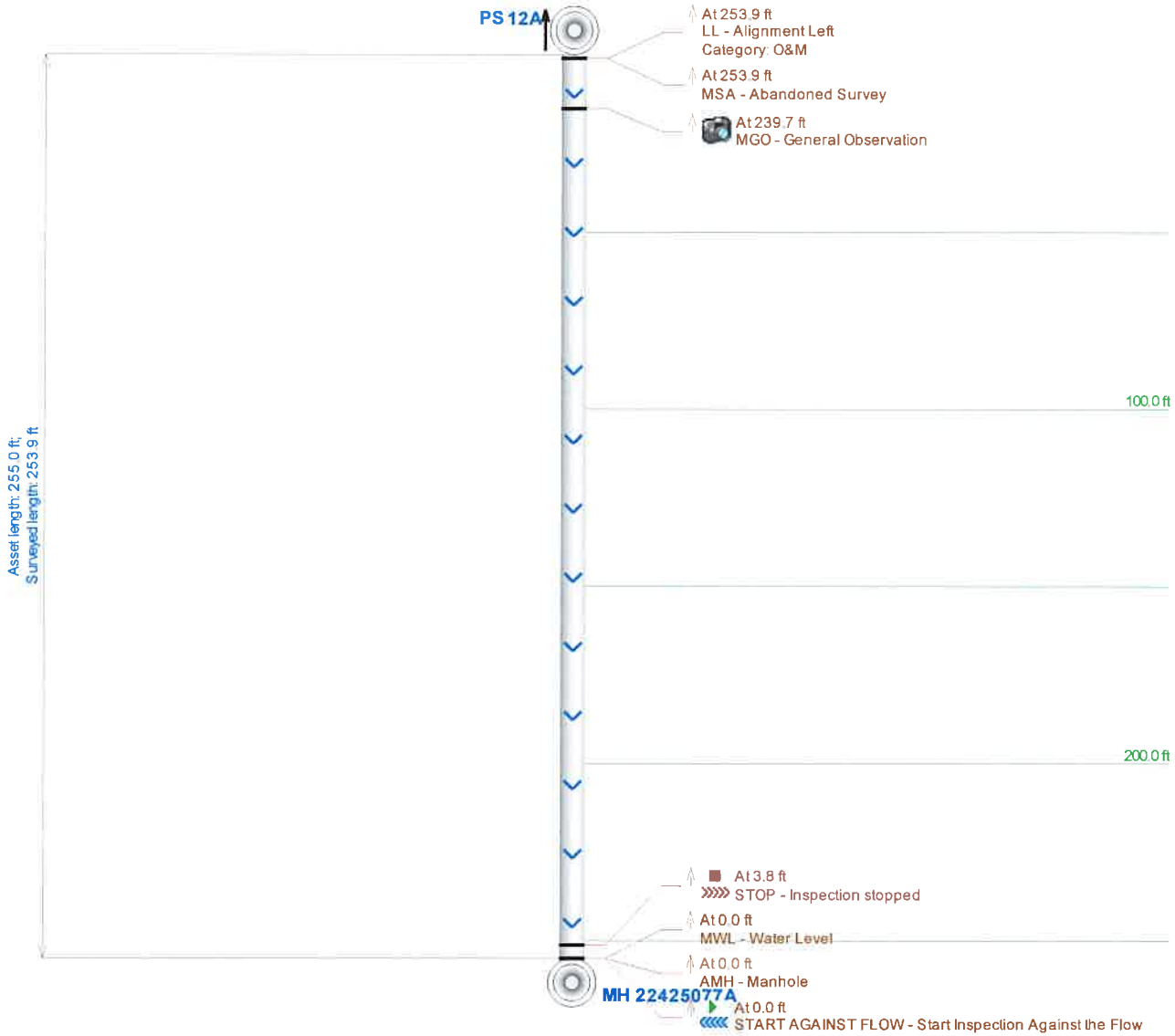


Photo 6-1 Exposed Rebar on Crown of 48" RCP

Photo 6-2 Gravity Junction w/ Exposed Rebar and Projecting Aggregate

The northern 300 ft of both DIP force mains had mortar lining missing from the crown with visible corrosion. This section of pipe drains down at the end of each pump cycle and is exposed to air, which can accelerate corrosion. Damage to the 24" crown was observed during the valve installation in 2011, as previously mentioned, but it was unknown at that time if it was isolated damage. These sections of pipe have reached the end of their useful life and will need to be addressed as a part of this project.

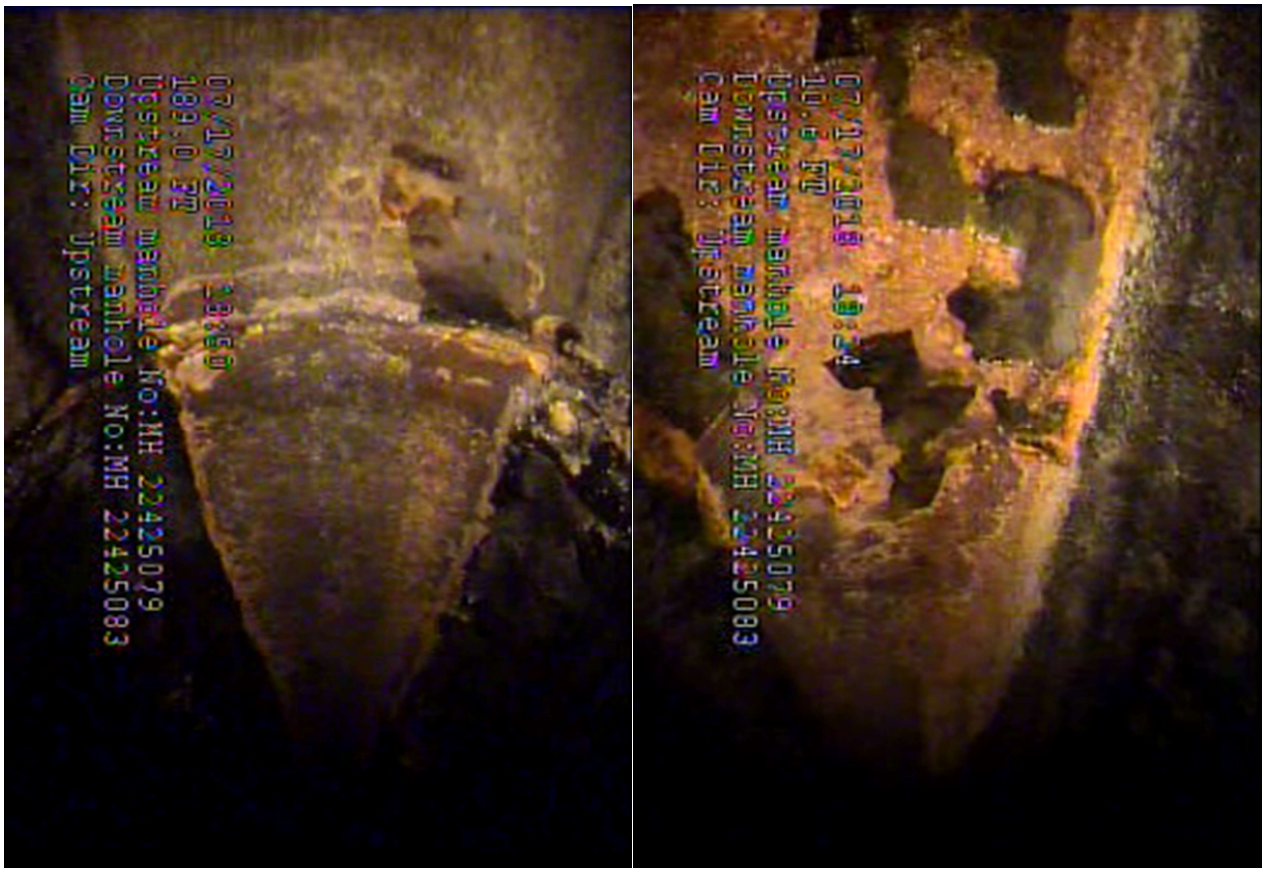


Photo 6-3 and 6-4 Corrosion on the Crowns of Both Force Mains (Northern 300')

Phase 2 Findings – Inspection of 20" DIP from existing cleanout manholes

The damage to the mortar lining on the crown of 20" DIP force main observed in Phase 1 continued until approximately 15' south of the 45 degree bends. This is still in the area where the wastewater drains down at the end of each pump cycle and the potentially aggressive wastewater and exposure to oxygen promote corrosion. The remainder of the 20" force main inspected in Phase 2 was in good condition, with two exceptions. A spot of missing mortar was found approximately 50 feet north of MH79. No significant corrosion was observed. Another spot of missing mortar was also found approximately 590 feet north of MH78. Minor corrosion was observed.

Photo 6-5 Corrosion on the Crown of 20" Force Main (beginning ~15' S of 45º bends)

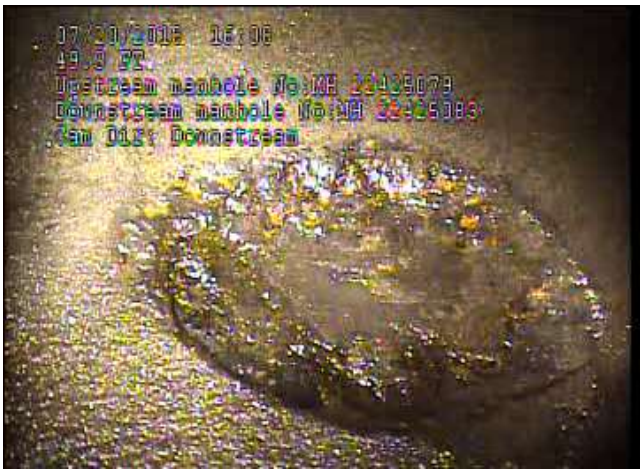


Photo 6-6 Missing Mortar on 20" Force Main (~50' N of MH79)

Photo 6-7 Missing Mortar w/ Minor Corrosion on 20" Force Main (~590' N of MH78)

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 SEWER IMPROVEMENTS

PUMP STATION 12 FORCE MAIN / INTERCEPTOR C GRAVITY JUNCTION REHABILITATION

SECTION XIV

TEMPORARY CONSTRUCTION PERMITS AND EASEMENTS

LEGAL DESCRIPTION:

Three areas contained within Tract A5 of Campbell Woods Subdivision, as recorded in plat 85–268, Anchorage Recording District, State of Alaska, more particularly described as follows:

AREA 1: Beginning at the northwest corner of said Tract A5, thence on the northerly boundary line of Tract A5 N89° 55' 29"E, 106.00 feet; thence departing said boundary line S0° 04' 31"E, 10.00 feet to a point on the existing T&E and utility easement line shown on plat 85–268, the True Point of Beginning for this easement; thence departing said easement line S44° 55' 29"W, 28.28 feet; thence S89° 55' 29"W, 48.50 feet; thence N0° 04' 31"W, 20.00 feet to a point on the said easement line; thence on the said easement line N89° 55' 29"E, 68.50 feet to the Point of Beginning.

AREA 2 & 3: Beginning at the northwest corner of said Tract A5, thence on the northerly boundary line of Tract A5 N89° 55' 29"E, 106.00 feet; thence departing said boundary line S0° 04' 31"E, 10.00 feet to a point on the existing T&E and utility easement line shown on plat 85–268, the True Point of Beginning for this easement; thence departing said easement line S0° 04' 31"E, 190.00 feet; thence N89° 55' 29"E, 110.00 feet; thence N0° 04' 31"W, 190.00 feet to a point on the said easement line; thence on the said easement line S89° 55' 29"W 110.00 feet to the Point of Beginning.

A total area of 22,070 square feet; with Area 1 having 1,170 square feet, Area 2 having 16,170 square feet and Area 3 having 4,730 square feet.

PLAT: Anchorage 85–268 TEMPORARY CONSTRUCTION PERMIT

Tract A5, Campbell Woods Subdivision, Anchorage Recording District

VEI Consultants
1345 RUDAKOF CIR #201
ANCHORAGE, AK 99508
PHONE: 337–3330
FAX: 338–5386

TEMPORARY CONSTRUCTION PERMIT

GRANTED TO AWWU

OWNER'S INITIAL _____

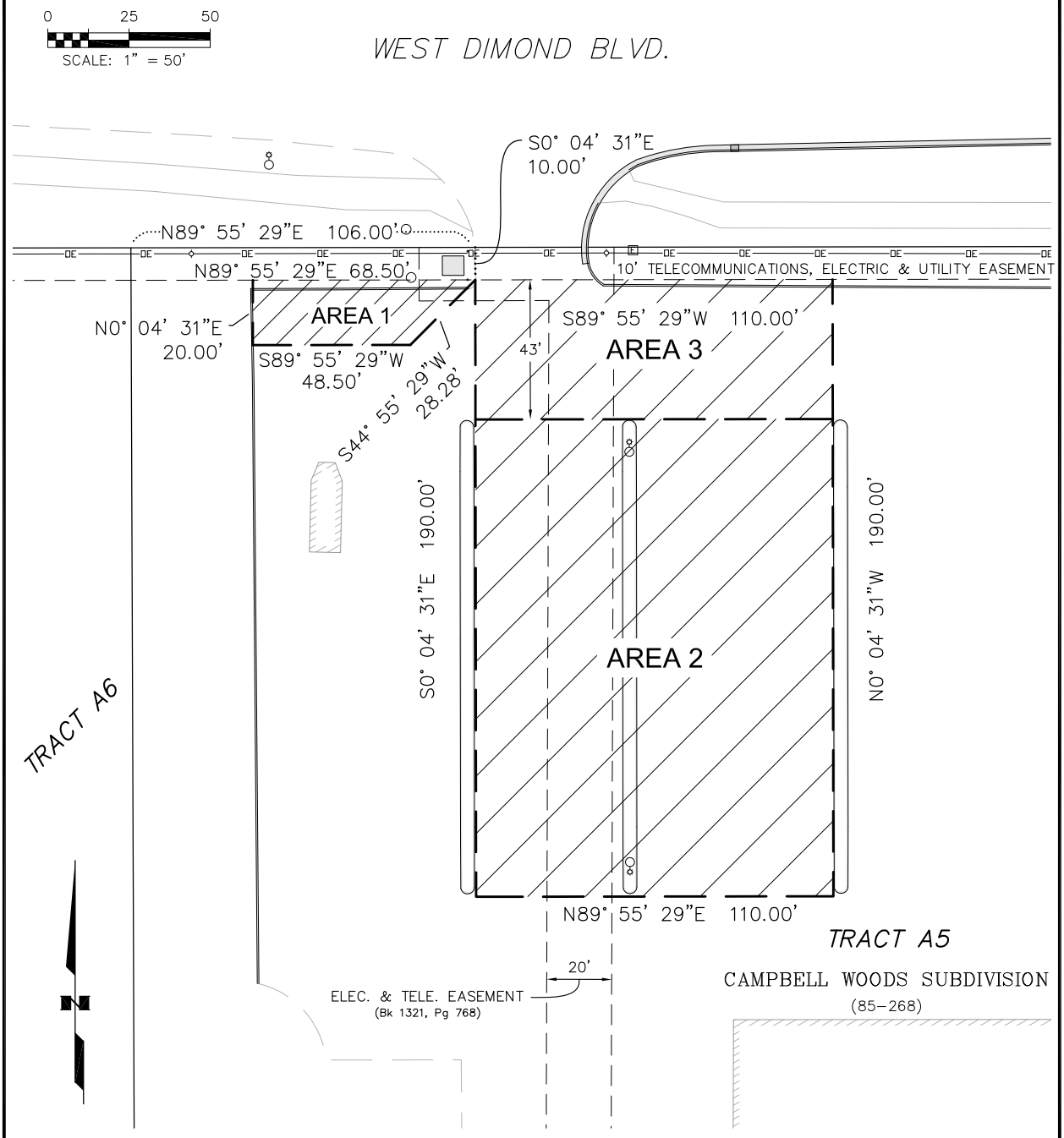
ATTACHED TO _____

PAGE 1 OF 2

TEMPORARY PERMIT AREA 22070 SF

DRAWN BY EVR

DATED 9/10/2021



PLAT: Anchorage 85–268 TEMPORARY CONSTRUCTION PERMIT

Tract A5, Campbell Woods Subdivision, Anchorage Recording District

VEI Consultants
1345 RUDAKOF CIR #201
ANCHORAGE, AK 99508
PHONE: 337–3330
FAX: 338–5386

TEMPORARY CONSTRUCTION PERMIT
GRANTED TO AWWU

OWNER'S INITIAL _____
ATTACHED TO _____
PAGE 2 OF 2

TEMPORARY PERMIT AREA 22070 SF
DRAWN BY EVR
SCALE 1"=50' DATED 9/10/2021

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 SEWER IMPROVEMENTS

PUMP STATION 12 FORCE MAIN / INTERCEPTOR C GRAVITY JUNCTION REHABILITATION

SECTION XV

PERMITS

AWWU has been granted the following permits:

- Army Corps of Engineers – 2 Nationwide Permits
  - NWP3 – Maintenance
  - NWP13 – Bank Stabilization
- ADF&G Habitat / Special Area Use Permits
- ADNR Temporary Use of Water Authorization (TUPA)

These permits apply mainly to the creek crossing, which is not in this contract. However, the Turnagain Truck access ramp (extending south from the PS12 site) is covered by several of the permits.

DEPARTMENT OF THE ARMY
ALASKA DISTRICT, U.S. ARMY CORPS OF ENGINEERS
REGULATORY DIVISION
P.O. BOX 6898
JBER, AK 99506-0898

November 1, 2021

Regulatory Division
POA-2020-00162

Anchorage Water & Wastewater Utility
Attention: Willie O'Malley
3000 Arctic Boulevard
Anchorage, AK 99503

Dear Mr. O'Malley:

This is in response to your March 18, 2021, application for a Department of the Army (DA) permit, to discharge approximately 250 cubic yards of fill and rip-rap into .02-acres of Campbell Creek and adjacent wetlands in order to construct a spur road and turn-around pad off of an existing sewer maintenance access road, remove two culverts, and construct a 225-foot long rip-rap bank stabilization. It has been assigned number POA-2020-00162, Campbell Creek which should be referred to in all future correspondence with this office. The project site is located within Latitude 61.129537º N., Longitude 149.960342º W.; in Anchorage, Alaska.

DA authorization is necessary because your project will involve dredged and fill material into waters of the U.S. under our regulatory jurisdiction. Specifically, the work would involve:

a. Restoring the existing sewer main access road within the easement, replacement of a section of force mains and the removal of two culverts on Campbell Creek, and the construction of a spur road and turn-around pad emanating from the existing access road. An additional 30 cubic yards of rip rap would be discharged into jurisdictional wetlands to stabilize the newly-constructed spur road emanating from the access road.

b. Upstream of the Campbell Creek crossing, the applicant proposes stabilizing the left bank (looking downstream) with 190 cubic yards of rip rap spread over 95 linear feet. A drain pipe and rip rap apron would be installed to drain an existing intermittent seep emanating from an adjacent wetland. Approximately 156 cubic yards would be placed below the mean high tide line of Campbell Creek, and the remaining 39 cubic yards would be placed in wetlands adjacent to Campbell Creek.

Based upon the information and plans you provided, we hereby verify that the work described under item “a” above, which would be performed in accordance with the enclosed plan (sheets 1-2), dated June 23, 2021, is authorized by Nationwide Permit (NWP) No. 3, Maintenance. Additionally, the work described under item “b” above, which would be performed in accordance with the enclosed plan (sheets 1-2), dated June 23, 2021, is authorized by NWP No. 13, Bank Stabilization. Enclosed is a copy of the NWPs No. 3 and No. 13, as well as the Regional and General Conditions. These documents are also available on our website at: www.poa.usace.army.mil/Missions/Regulatory/Permits. Regional Conditions D, E, and F apply to your project. You must comply with all terms and conditions associated with NWPs No. 3 and No. 13.

Further, please note General Condition 30 requires that you submit a signed certification to us once any work and required mitigation are completed. Enclosed is the form for you to complete and return to us.

Unless this NWP is modified or revoked, it expires on March 18, 2022**.** If you commence or are under contract to commence this activity before the date that the 2017 NWPs are modified or revoked, you will have twelve (12) months from the date of the modification or revocation of the NWPs to complete the activity under the present terms and conditions of these nationwide permits. It is incumbent upon you to remain informed of the changes to the NWPs. Nothing in this letter excuses you from compliance with other Federal, State, or local statutes, ordinances, or regulations.

Please contact me via email at lucas.j.byker@usace.army.mil, by mail at the address above, by phone at (907) 753-2760, or toll free from within Alaska at (800) 478-2712, if you have questions or to request paper copies of the regional and/or general conditions. For additional information about our Regulatory Program, visit our website at www.poa.usace.army.mil/Missions/Regulatory.

Sincerely,

Lucas Byker
Regulatory Specialist

Enclosures:
Figures Sheets
General Conditions
Regional Conditions
NWP 3 and 13

US Army Corps of Engineers
Alaska District

Permit Number: POA-2020-00162

Name of Permittee: Anchorage Water & Wastewater Utility

Date of Issuance: November 1, 2021

Upon completion of the activity authorized by this permit and any mitigation required by the permit, sign this certification and return it to Mr. Lucas Byker at lucas.j.byker@usace.army.mil or the following address:

U.S. Army Corps of Engineers
Alaska District
Regulatory Division
Post Office Box 6898
JBER, Alaska 99506-0898

Please note that your permitted activity is subject to a compliance inspection by an U.S. Army Corps of Engineers representative. If you fail to comply with this permit you are subject to permit suspension, modification, or revocation.

I hereby certify that the work authorized by the above-referenced permit has been completed in accordance with the terms and conditions of the said permit, and required mitigation was completed in accordance with the permit conditions.

_____ _____
Signature of Permittee Date

3. Maintenance

a) The repair, rehabilitation, or replacement of any previously authorized, currently serviceable structure or fill, or of any currently serviceable structure or fill authorized by 33 CFR 330.3, provided that the structure or fill is not to be put to uses differing from those uses specified or contemplated for it in the original permit or the most recently authorized modification. Minor deviations in the structure's configuration or filled area, including those due to changes in materials, construction techniques, requirements of other regulatory agencies, or current construction codes or safety standards that are necessary to make the repair, rehabilitation, or replacement are authorized. This NWP also authorizes the removal of previously authorized structures or fills. Any stream channel modification is limited to the minimum necessary for the repair, rehabilitation, or replacement of the structure or fill; such modifications, including the removal of material from the stream channel, must be immediately adjacent to the project. This NWP also authorizes the removal of accumulated sediment and debris within, and in the immediate vicinity of, the structure or fill. This NWP also authorizes the repair, rehabilitation, or replacement of those structures or fills destroyed or damaged by storms, floods, fire or other discrete events, provided the repair, rehabilitation, or replacement is commenced, or is under contract to commence, within two years of the date of their destruction or damage. In cases of catastrophic events, such as hurricanes or tornadoes, this two-year limit may be waived by the district engineer, provided the permittee can demonstrate funding, contract, or other similar delays.

b) This NWP also authorizes the removal of accumulated sediments and debris outside the immediate vicinity of existing structures (e.g., bridges, culverted road crossings, water intake structures, etc.). The removal of sediment is limited to the minimum necessary to restore the waterway in the vicinity of the structure to the approximate dimensions that existed when the structure was built, but cannot extend farther than 200 feet in any direction from the structure. This 200 foot limit does not apply to maintenance dredging to remove accumulated sediments blocking or restricting outfall and intake structures or to maintenance dredging to remove accumulated sediments from canals associated with outfall and intake structures. All dredged or excavated materials must be deposited and retained in an area that has no waters of the United States unless otherwise specifically approved by the district engineer under separate authorization.

c) This NWP also authorizes temporary structures, fills, and work, including the use of temporary mats, necessary to conduct the maintenance activity. Appropriate measures must be taken to maintain normal downstream flows and minimize flooding to the maximum extent practicable, when temporary structures, work, and discharges, including cofferdams, are necessary for construction activities, access fills, or dewatering of construction sites. Temporary fills must consist of materials, and be placed in a manner, that will not be eroded by expected high flows. After conducting the maintenance activity, temporary fills must be removed in their entirety and the affected areas returned to pre- construction elevations. The areas affected by temporary fills must be revegetated, as appropriate.

d) This NWP does not authorize maintenance dredging for the primary purpose of navigation. This NWP does not authorize beach restoration. This NWP does not authorize new stream channelization or stream relocation projects.

Notification: For activities authorized by paragraph (b) of this NWP, the permittee must submit a pre- construction notification to the district engineer prior to commencing the activity (see general condition 32). The pre-construction notification must include information regarding the original design capacities and configurations of the outfalls, intakes, small impoundments, and canals. (Authorities: Section 10 of the Rivers and Harbors Act of 1899 and section 404 of the Clean Water Act (Sections 10 and 404))

Note: This NWP authorizes the repair, rehabilitation, or replacement of any previously authorized structure or fill that does not qualify for the Clean Water Act section 404(f) exemption for maintenance.

Figure 1: Project map submitted by the applicant showing the work to be completed (highlighted in yellow). The spur road and turn-around are drawn emanating from the existing maintenance path, and the culverts proposed for removal are highlighted in red.

Figure 2: Area of proposed spur road emanating from existing maintenance road across jurisdictional wetlands.

Figure 3: Culverts and rip-rap embankment for proposed removal.

13. Bank Stabilization

Bank stabilization activities necessary for erosion control or prevention, such as vegetative stabilization, bioengineering, sills, rip rap, revetment, gabion baskets, stream barbs, and bulkheads, or combinations of bank stabilization techniques, provided the activity meets all of the following criteria:

a) No material is placed in excess of the minimum needed for erosion protection;

b) The activity is no more than 500 feet in length along the bank, unless the district engineer waives this criterion by making a written determination concluding that the discharge will result in no more than minimal adverse environmental effects (an exception is for bulkheads—the district engineer cannot issue a waiver for a bulkhead that is greater than 1,000 feet in length along the bank);

c) The activity will not exceed an average of one cubic yard per running foot, as measured along the length of the treated bank, below the plane of the ordinary high water mark or the high tide line, unless the district engineer waives this criterion by making a written determination concluding that the discharge will result in no more than minimal adverse environmental effects;

d) The activity does not involve discharges of dredged or fill material into special aquatic sites, unless the district engineer waives this criterion by making a written determination concluding that the discharge will result in no more than minimal adverse environmental effects;

e) No material is of a type, or is placed in any location, or in any manner, that will impair surface water flow into or out of any waters of the United States;

f) No material is placed in a manner that will be eroded by normal or expected high flows (properly anchored native trees and treetops may be used in low energy areas);

g) Native plants appropriate for current site conditions, including salinity, must be used for bioengineering or vegetative bank stabilization;

h) The activity is not a stream channelization activity; and

i) The activity must be properly maintained, which may require repairing it after severe storms or erosion events. This NWP authorizes those maintenance and repair activities if they require authorization.

This NWP also authorizes temporary structures, fills, and work, including the use of temporary mats, necessary to construct the bank stabilization activity. Appropriate measures must be taken to maintain normal downstream flows and minimize flooding to the maximum extent practicable, when temporary structures, work, and discharges, including cofferdams, are necessary for construction activities, access fills, or dewatering of construction sites.

Temporary fills must consist of materials, and be placed in a manner, that will not be eroded by expected high flows. After construction, temporary fills must be removed in their entirety and the affected areas returned to pre- construction elevations. The areas affected by temporary fills must be revegetated, as appropriate.

Notification: The permittee must submit a pre-construction notification to the district engineer prior to commencing the activity if the bank stabilization activity: (1) Involves discharges into special aquatic sites; or is in excess of 500 feet in length; or will involve the discharge of greater than an average of one cubic yard per running foot as measured along the length of the treated bank, below the plane of the ordinary high water mark or the high tide line. (See general condition 32.) (Authorities: Sections 10 and 404)

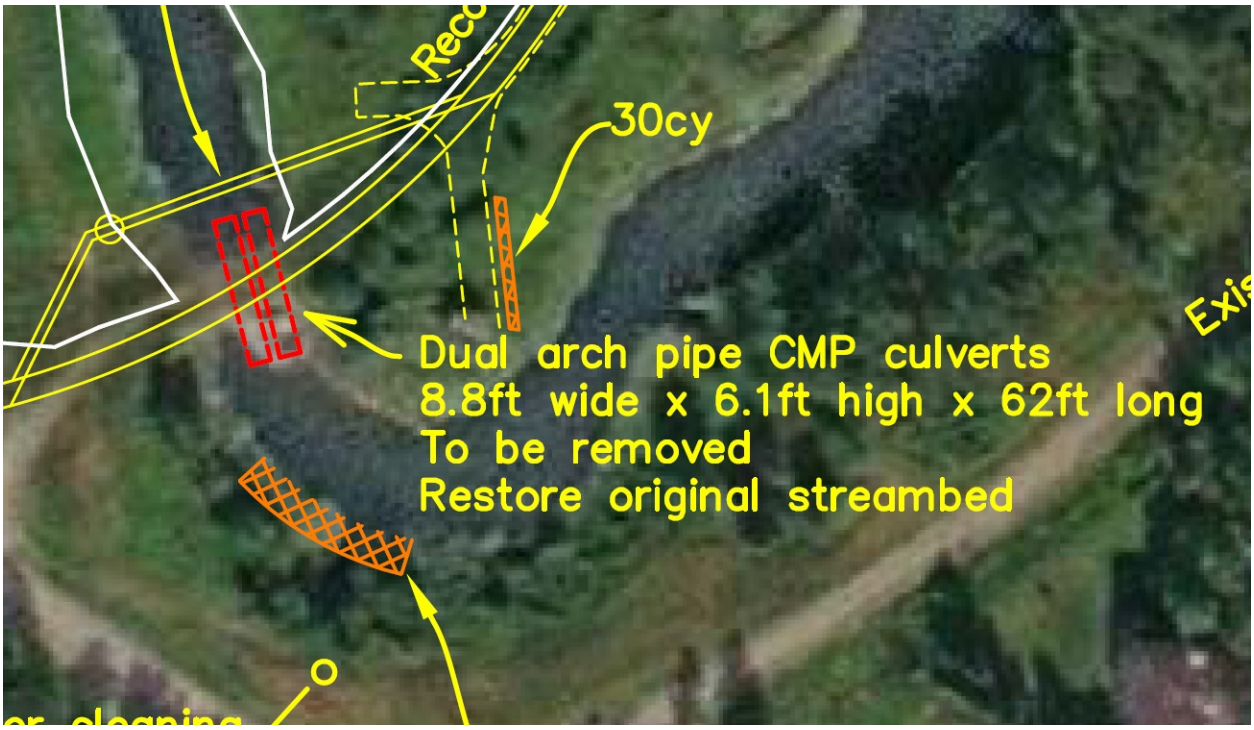


Figure 1: Diagram submitted by the applicant showing the revised streambank stabilizations (orange cross-hatching).

Figure 2: View of the bank stabilization area, looking upstream from the existing culverts and embankment.

Figure 3: Bank stabilization area, looking towards Campbell Creek. The drainage in the foreground will be lined with a drain pipe and rip-rap apron.

10

1ft contours

VLR/VEI

9/23/21

N

Quantity = 150 cy Available (150-200)
approx 2cy/ft

CAMPBELL CREEK

Culvert Crossing
90 ft +/-

Transition
to Existing
Slope

Existing Inverted
Siphon Crossing

Bottom of Stream
Elev= -2 ft ±

Rip Rap
Slope Protection
L= 95'

Rip Rap
Fill
L= 2'

2:1

Daylight
IE

Rip Rap
Full Depth

24" HDPE
Pond Culvert

5'

Transition
to Existing
Slope

10'

Spoils

Rip Rap
Fill

Open End
IE, 9.0'

Rip Rap
Splash Pad

Grass Line
ELEV= 9.0 ±
Approx MHW

Spoils

MH 33

POA 2020-00162 **9/27/21**
Applicant: AWWU Agent: VEI Consultants
Waterway: Campbell Creek
Project: PS12 Slope Protection Plan
At Inverted Syphon Location

THE STATE of ALASKA
GOVERNOR MIKE DUNLEAVY

Department of Fish and Game

HABITAT SECTION
Southcentral Regional Office

333 Raspberry Road
Anchorage, Alaska
Main: 907.267.2342
Fax: 907.267.2499

SPECIAL AREA PERMIT FH21-II-0111-SA

ISSUED: November 12, 2021
EXPIRES: December 31, 2026

Anchorage Water & Wastewater Utility
Attn: Will O'Malley
3000 Arctic Boulevard
Anchorage, AK 99503

RE: Sewer Force Main Rehabilitation
Anchorage Coastal Wildlife Refuge
Campbell Creek (Water Body No. 247-60-10340)
Section 15, T 12 N, R 4 W, SM
Location: 61.1297 N, 149.9606 W
Culvert No. 20401812

Dear Mr. O'Malley:

Pursuant to AS 16.20.036, AS 16.20.050, AS 16 20.060, and 5 AAC 95.400-.440, 5 AAC 95.510-.515, 5 AAC 95.700-.990, and AS 16.05.871 (b), the Alaska Department of Fish and Game (ADF&G), Habitat Section has reviewed your proposal to relocate a section of dual sewer force main and remove two culverts from Campbell Creek within the Anchorage Coastal Wildlife Refuge (ACWR).

Project Description
The current sewer force mains follow a path east from AWWU Pump Station 12 across Campbell Creek above two 8-foot diameter culverts, then north toward Dimond Boulevard. You propose to reroute the sewer mains to pass beneath Campbell Creek about 50 feet downstream of the current location (Figure 2). After the new section of sewer main is constructed, the decommissioned section and the two culverts in Campbell Creek will be removed. Work is expected to occur between December 2021 and February 2022 to ensure the ground is frozen and adequate snow cover is present to protect vegetation at the site. The exact work window will be selected based on the tide cycles to allow work to occur during a period of lower tidal fluctuation. The use of two tracked, long-boom excavators, a tracked bulldozer, and several dump trucks is expected to complete the project.

Site Preparation
Prior to trench excavation, installation of new pipe, and culvert removal, a steel pipe bypass flume will be installed. Ice will be removed from the excavation area to expose the ground, and riprap from the outlet of the culverts will be removed. A 50-foot long, 60-inch diameter steel pipe will be placed at the outlet of the east culvert, serving as a bypass flume to convey stream flow through the work site and discharge downstream (Sheet 79). The west culvert will be sealed at the inlet with super sacks and sandbags to divert flow into the east culvert and temporary flume. Silt fencing will be installed upstream of the flume discharge to limit backwatering into the trench excavation area.

Creek Under-Crossing
Upon completion of the bypass flume, trench excavation will begin. Excavation will start from the center of the stream channel and work toward the banks. The trench is expected to be up to 50 feet wide to accommodate the required depth of 20 feet, which will place the new force main pipes 8-10 feet below the streambed (Sheet 82). After the proper grade is reached, the preassembled pipes will be pulled into the trench, floated beneath the flume, and filled with water. Once pipes are aligned, concrete horseshoe anchors will be placed to sink the pipes side-by-side to the bottom of the trench. After confirming alignment, a manhole assembly will be placed on the west end of the pipes, and the trench will be backfilled and compacted to match the existing grade of Campbell Creek (Sheet 79). The bypass flume will then be removed.

Culvert Removal
After removing the bypass flume, the remaining riprap, decommissioned force main sections, and culverts will be removed from Campbell Creek, and the streambanks will be reconstructed to match the upstream and downstream elevations.

Streambank Rehabilitation and Site Revegetation
All streambank rehabilitation at the culvert site and the under-crossing site will be performed to return the site to as close to pre-construction conditions as possible. Riprap may be used to backfill and rebuild the streambanks, but no riprap will be visible above the existing mudline in Campbell Creek. All disturbed areas above the existing mudline will be covered with native material and revegetated using salvaged vegetative mat from the site that was harvested with a thickness of at least 18 inches. Any disturbed areas within ACWR that cannot be stabilized using salvaged vegetative mat will be revegetated under guidance from the Plant Materials Center using native species and their recommended methods. Rehabilitation work will be monitored for five years after construction to ensure revegetation and stability are maintained and succeeding.

Legislatively Designated Special Area
The ACWR was established pursuant to 16.20.031(a) to protect waterfowl, shorebirds, salmon, and other fish and wildlife species and their habitat, and for the use and enjoyment of the people of Alaska. Alaska statutes and the ACWR Management Plan policies allow for multiple land use activities within the refuge to be authorized by Special Area Permit if the activity provides for the proper protection of fish and wildlife resources. The proposed activities to remove two existing culverts and relocate a section of dual force main are not expected to adversely impact habitat values or fish and wildlife populations provided the stipulations contained herein are adhered to.

Anadromous Fish Act
Water Body No. 247-60-10340 has been specified as being important for the spawning, rearing, or migration of anadromous fishes pursuant to AS 16.05.871(a). The water body provides habitat for Chinook, coho, pink, and sockeye salmon, and Dolly Varden.

In accordance with 5 AAC 95 and AS 16.05.871(d), your project is approved subject to the project description, the following stipulations, and the permit terms.

1. Intentional harassment, disturbance, or displacement of wildlife is prohibited.

2. All waste or refuse shall be removed from the ACWR. No waste materials including food, trash, refuse, or other items shall be burned, discarded, abandoned, or otherwise disposed of on lands or waters within the ACWR. Food and refuse shall be stored in a manner that does not attract wildlife and prevents wildlife from accessing it.

3. Fuel, oil, or any other petrochemical products shall not be stored, and vehicles and equipment shall not be refueled within the ACWR. No vehicles or equipment leaking fuels, oils, hydraulic, or cooling fluids shall be operated within the ACWR.

4. Except for temporary restrictions to provide safety exclusion zones around equipment and truck activities, the project shall not unreasonably restrict or interfere with public access to or use of state land, or to fish and wildlife resources.

5. Annual monitoring reports on streambank rehabilitation and site revegetation status, including photographs and site descriptions, shall be provided to the ADF&G Habitat Section. Monitoring reports shall be submitted by November 1st each year from 2022 through 2026.

6. If monitoring indicates that revegetation failure, subsidence, or erosion attributable to the project has occurred at the project site, additional restoration work may be required and appropriate mitigation measures shall be determined in consultation with ADF&G Habitat.

7. The ADF&G Habitat Section shall be notified by phone (267-2342) or email (dfg.hab.infoanc@alaska.gov) a minimum of 7 days prior to beginning activities authorized by this permit.

Permit Terms
This letter constitutes a permit issued under the authority of AS 16.20.060 and AS 16.05.871 and must be retained on site during project activities. Please be advised that this determination applies only to activities regulated by the Habitat Section; other agencies also may have jurisdiction under their respective authorities. This determination does not relieve you of your responsibility to secure other permits; state, federal, or local. You are still required to comply with all other applicable laws.

You are responsible for the actions of contractors, agents, or other persons who perform work to accomplish the approved project. For any activity that significantly deviates from the approved

plan, you shall notify the Habitat Section and obtain written approval in the form of a permit amendment in accordance with 5 AAC 95.740 before beginning the activity. Any action that increases the project's overall scope or that negates, alters, or minimizes the intent or effectiveness of any provision contained in this permit will be deemed a significant deviation from the approved plan. The final determination as to the significance of any deviation and the need for a permit amendment is the responsibility of the Habitat Section. Therefore, we recommend you consult the Habitat Section immediately before considering any deviation from the approved plan.

You shall give an authorized representative of the state free and unobstructed access to the permit site, at safe and reasonable times, for the purpose of inspecting or monitoring compliance with any provision of this permit. You shall furnish whatever assistance and information the authorized representative reasonably requires for monitoring and inspection purposes.

In addition to the penalties provided by law, this permit may be terminated or revoked for failure to comply with its provisions or failure to comply with applicable statutes and regulations. You shall mitigate any adverse effect upon fish or wildlife, their habitats, or any restriction or interference with public use that the commissioner determines was a direct result of your failure to comply with this permit or any applicable law.

You shall indemnify, save harmless, and defend the department, its agents, and its employees from any and all claims, actions, or liabilities for injuries or damages sustained by any person or property arising directly or indirectly from permitted activities or your performance under this permit. However, this provision has no effect if, and only if, the sole proximate cause of the injury is the department's negligence.

You may appeal this permit decision relating to AS 16.05.871 in accordance with the provisions of AS 44.62.330-630.

Questions about this permit may be directed to Habitat Biologist Scott Graziano at 267-2143 or scott.graziano@alaska.gov.

Sincerely,
Doug Vincent-Lang
Commissioner

By Ron Benkert
Southcentral Regional Supervisor

Enclosures: Figure 2. Project Site Plan
Sheet 79. Bypass Flume and Manhole Location
Sheet 82. Trench Details

Email cc:

A. Ott, ADF&G-HAB
J. Baumer, ADF&G-SF
D. Battle, ADF&G-WC
J. Meehan, ADF&G-WC
T. Massie, ADF&G-HAB
G. O'Doherty, ADF&G-SF
C. Larson, ADNR DMLW
ADNR Water Resources
J. Rypkema, ADEC
USACE, Regulatory
S. Ellis, MOA
AWT, Anchorage

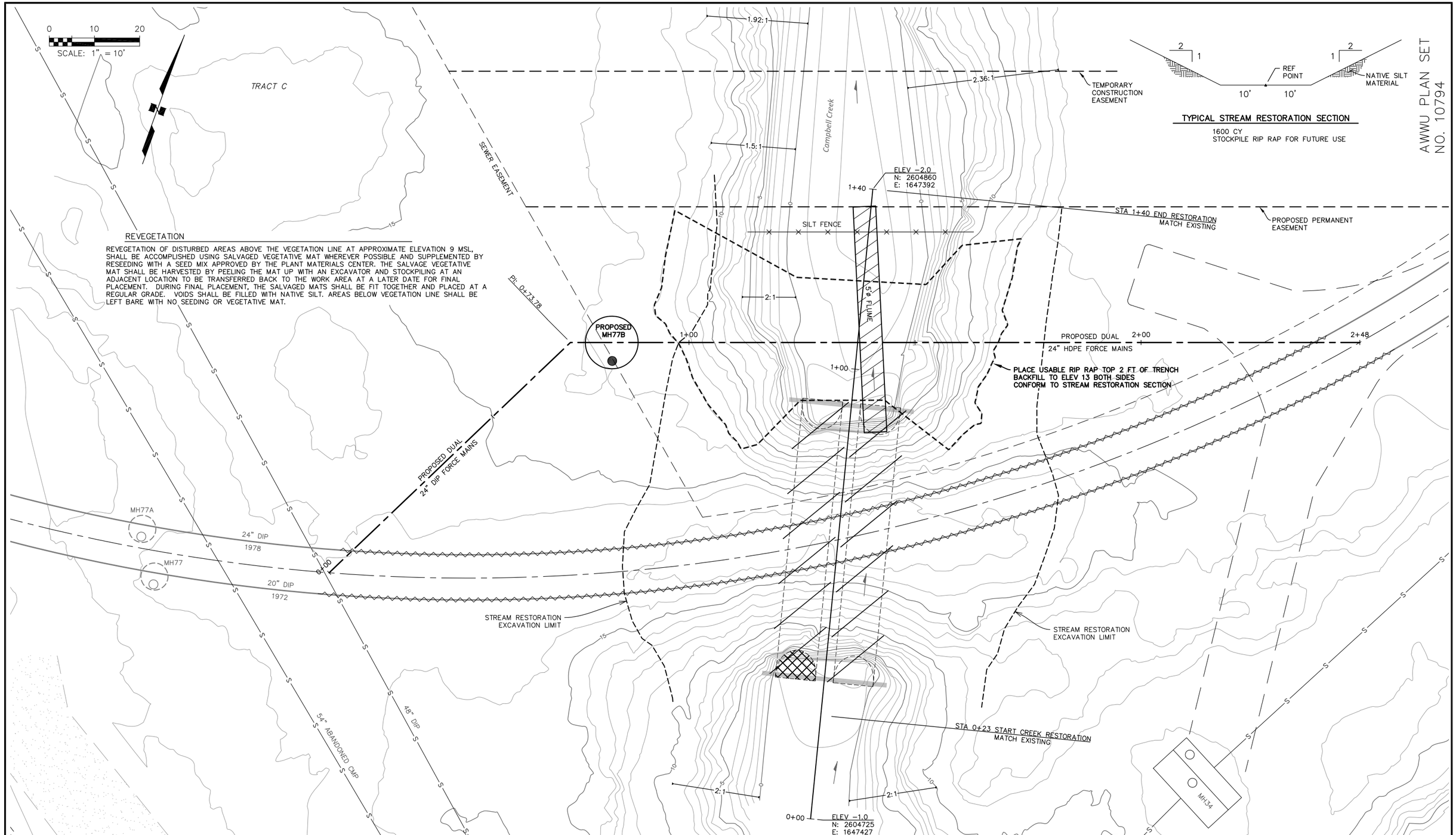
Figure 2 (r3) - PROJECT SITE PLAN

0 200'

MUNICIPALITY OF ANCHORAGE, ALASKA

VEI Consultants

APPLICANT: AWWU		DATE:	5/28/21
WATERWAY: Campbell Creek		GRID:	SW2525
PROPOSED ACTIVITY: Stream Undercrossing		SHEET NO:	2 of 7



REVEGETATION

REVEGETATION OF DISTURBED AREAS ABOVE THE VEGETATION LINE AT APPROXIMATE ELEVATION 9 MSL, SHALL BE ACCOMPLISHED USING SALVAGED VEGETATIVE MAT WHEREVER POSSIBLE AND SUPPLEMENTED BY RESEEDING WITH A SEED MIX APPROVED BY THE PLANT MATERIALS CENTER. THE SALVAGE VEGETATIVE MAT SHALL BE HARVESTED BY PEELING THE MAT UP WITH AN EXCAVATOR AND STOCKPILING AT AN ADJACENT LOCATION TO BE TRANSFERRED BACK TO THE WORK AREA AT A LATER DATE FOR FINAL PLACEMENT. DURING FINAL PLACEMENT, THE SALVAGED MATS SHALL BE FIT TOGETHER AND PLACED AT A REGULAR GRADE. VOIDS SHALL BE FILLED WITH NATIVE SILT. AREAS BELOW VEGETATION LINE SHALL BE LEFT BARE WITH NO SEEDING OR VEGETATIVE MAT.

VERIFY SCALE THIS BAR REPRESENTS ONE INCH ON ORIGINAL DRAWING. 0" ■ 1" IF BAR IS NOT ONE INCH, ADJUST DRAWING SCALE ACCORDINGLY. FULL SIZE SCALE HORZ SCALE: 1"=10' VERT SCALE:

DATA	DRAWN BY	CHECKED BY	DATA	DRAWN BY	CHECKED BY
BASE	EVR	VLR	TELEPHONE	---	---
TOPOGRAPHY	---	---	ELECTRIC	---	---
PROFILE	---	---	CABLE TV	---	---
SANITARY SEWER	---	---	TRAFFIC SIGNAL	---	---
STORM SEWER	---	---	DESIGN	---	---
WATER	---	---	QUANTITIES	---	---
GAS	---	---	MUN. FINAL CHECK	---	---

PLAN CHECK

REV	DATE	DESCRIPTION	BY

REVISIONS

RECORD DRAWING Note: To be filled out on original drawings upon project completion.

1. DATA PROVIDED BY: _____
   This shall serve to certify that these Record Drawings are a true and accurate representation of the project as constructed.
   CONTRACTOR: _____
   BY: _____ TITLE: _____
   DATE: _____
2. DATA TRANSFERRED BY: _____
   COMPANY: _____
   DATE: _____
3. Based on periodic field observations by the Engineer (or an individual under his/her direct supervision), the Contractor-provided data appears to represent the project as constructed.
   DATA TRANSFER CHECKED BY: _____
   COMPANY: _____
   BY: _____ TITLE: _____
   DATE: _____

VEI Consultants
PHONE: 337-3330
1345 RUDAKOF CIR #201
ANCHORAGE, AK 99508
LICENSE #AECC368
CONSULTANT

STATE OF ALASKA 49TH
VERNON L. ROELFS
CE-5107
REGISTERED PROFESSIONAL ENGINEER
SEAL

ANCHORAGE WATER & WASTEWATER UTILITY
AWWU
MUNICIPALITY OF ANCHORAGE

MUNICIPALITY OF ANCHORAGE
WATER & WASTEWATER UTILITY

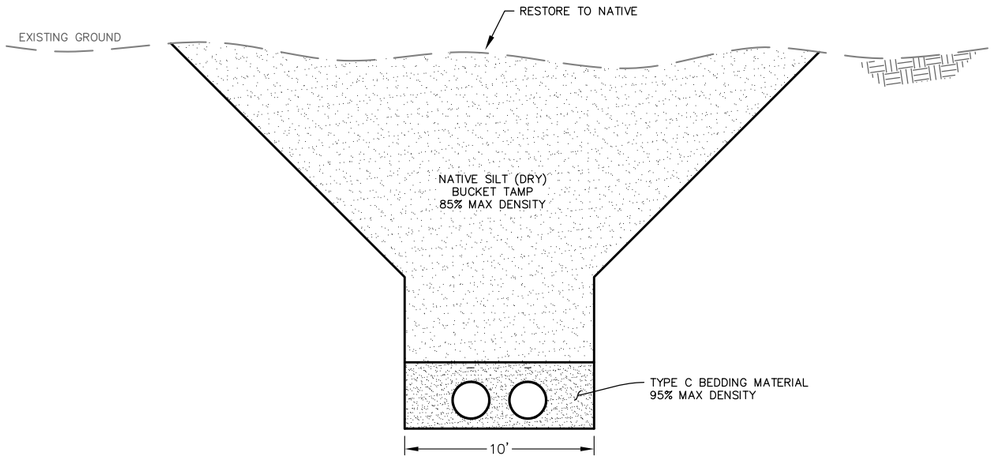
SCHEDULE B

PS12 FORCE MAIN / GRAVITY JUNCTION REHAB

STREAM RESTORATION

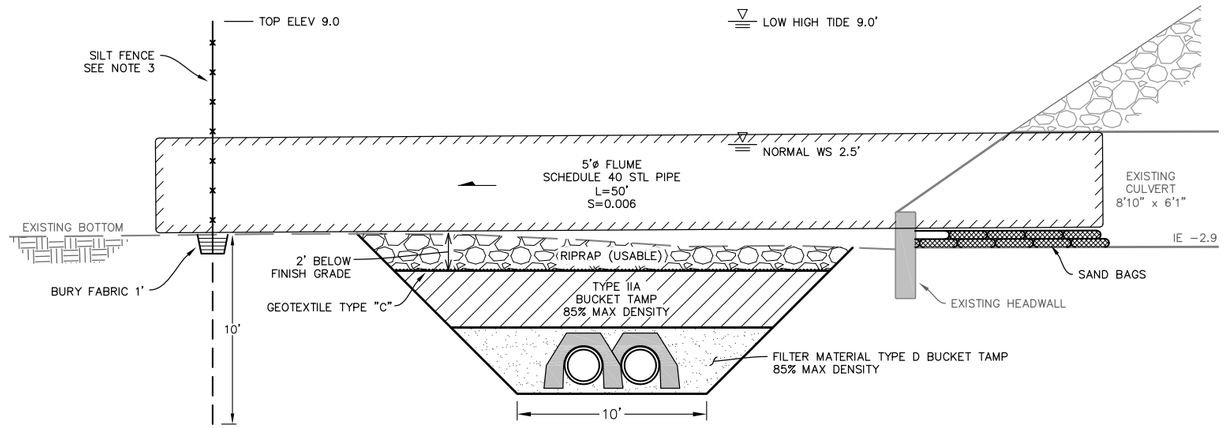
U3

HORZ SCALE: 1"=10' VERT SCALE: | DATE: 10/29/2021 | GRID: SW 2525 | PROJ. ID.: WW.H7713



1 U6 TRENCH SECTION STA 0+00 to MH77B

0 2' 4'

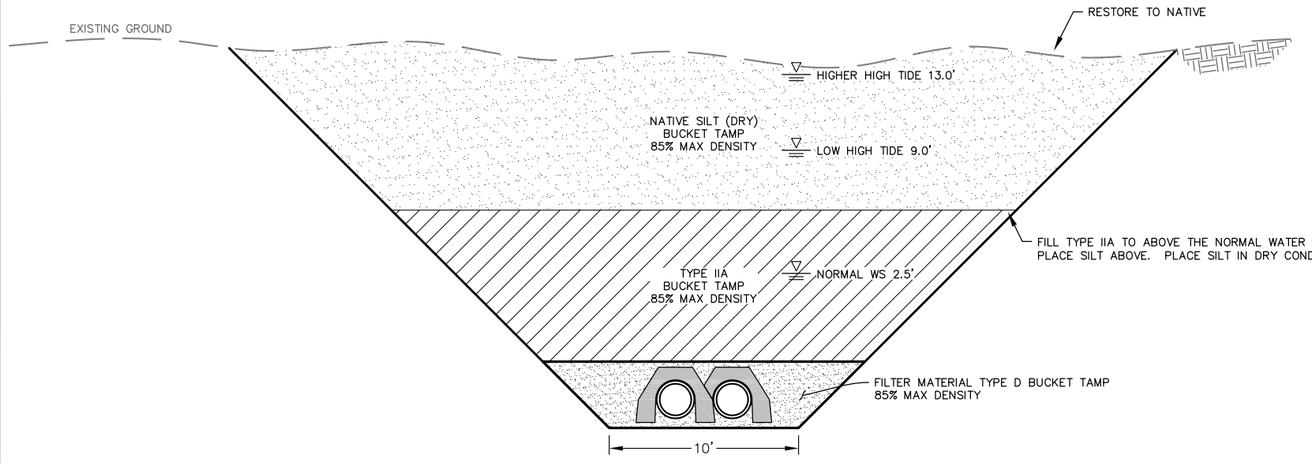


2 U6 FLUME AND IN CHANNEL SECTION STA 0+95 to 1+70

0 2' 4'

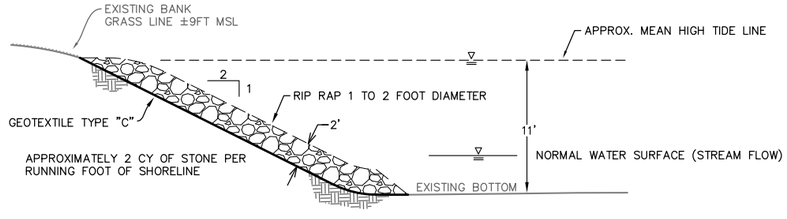
NOTES:

1. REVEGETATION OF DISTURBED AREAS ABOVE THE VEGETATION LINE AT APPROXIMATE ELEVATION 9 MSL, SHALL BE ACCOMPLISHED USING SALVAGED VEGETATIVE MAT WHEREVER POSSIBLE AND SUPPLEMENTED BY RESEEDING WITH A SEED MIX APPROVED BY THE PLANT MATERIALS CENTER. THE SALVAGE VEGETATIVE MAT SHALL BE HARVESTED BY PEELING THE MAT UP WITH AN EXCAVATOR AND STOCKPILING AT AN ADJACENT LOCATION TO BE TRANSFERRED BACK TO THE WORK AREA AT A LATER DATE FOR FINAL PLACEMENT. DURING FINAL PLACEMENT, THE SALVAGED MATS SHALL BE FIT TOGETHER AND PLACED AT A REGULAR GRADE. VOIDS SHALL BE FILLED WITH NATIVE SILT. AREAS BELOW VEGETATION LINE SHALL BE LEFT BARE WITH NO SEEDING OR VEGETATIVE MAT.
2. F&I DETECTABLE WARNING TAPE ABOVE EACH PIPE.
3. THE SILT FENCE SHALL BE IN ACCORDANCE WITH MASS SECTION 70.19. THE FENCE SHALL BE CONSTRUCTED ACROSS THE CREEK AS SHOWN USING DRIVEN 4" STEEL PILES AT 10 FOOT INTERVALS. SILT FENCE FABRIC SHALL BE REINFORCED AS NECESSARY TO MAINTAIN THE INTEGRITY OF THE FENCE. THE 4" STEEL PILES SHALL BE SERVICEABLE SCHEDULE 40 (MIN) STEEL PIPE, DRILLING TUBING OR APPROVED EQUAL. THE PILES AND FENCING SHALL BE THOROUGHLY REMOVED AT THE COMPLETION OF THE UNDERCROSSING WORK.



3 U6 TRENCH SECTION STA 1+70 to End

0 2' 4'



4 U6 STREAM BANK STABILIZATION

SCALE: N.T.S.

VERIFY SCALE THIS BAR REPRESENTS ONE INCH ON ORIGINAL DRAWING. 0" ——— 1"

IF BAR IS NOT ONE INCH, ADJUST DRAWING SCALE ACCORDINGLY. FULL SIZE SCALE HORZ SCALE: 1"=4' VERT SCALE: 1"=4'

DATA	DRAWN BY	CHECKED BY	DATA	DRAWN BY	CHECKED BY
BASE	EVR	VLR	TELEPHONE	---	---
TOPOGRAPHY	---	---	ELECTRIC	---	---
PROFILE	---	---	CABLE TV	---	---
SANITARY SEWER	---	---	TRAFFIC SIGNAL	---	---
STORM SEWER	---	---	DESIGN	---	---
WATER	---	---	QUANTITIES	---	---
GAS	---	---	MUN. FINAL CHECK	---	---

PLAN CHECK

REV	DATE	DESCRIPTION	BY

REVISIONS

RECORD DRAWING Note: To be filled out on original drawings upon project completion.

1. DATA PROVIDED BY: —
   This shall serve to certify that these Record Drawings are a true and accurate representation of the project as constructed.
   CONTRACTOR: —
   BY: _____ TITLE: —
   DATE: —
2. DATA TRANSFERRED BY: —
   COMPANY: —
   DATE: —
3. Based on periodic field observations by the Engineer (or an individual under his/her direct supervision), the Contractor-provided data appears to represent the project as constructed.
   DATA TRANSFER CHECKED BY: —
   COMPANY: —
   BY: _____ TITLE: —
   DATE: —

VEI Consultants
PHONE: 337-3330
1345 RUDAKOF CIR #201
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CONSULTANT

STATE OF ALASKA 49TH
VERNON L. ROELFS
CE-5107
REGISTERED PROFESSIONAL ENGINEER
SEAL

MUNICIPALITY OF ANCHORAGE
WATER & WASTEWATER UTILITY

SCHEDULE B

PS12 FORCE MAIN / GRAVITY JUNCTION REHAB

DETAILS

U6

HORZ SCALE: 1"=4' VERT SCALE: 1"=4' | DATE: 10/29/2021 | GRID: SW 2525 | PROJ. ID.: WW.H7713

THE STATE of ALASKA
GOVERNOR MIKE DUNLEAVY

Department of Fish and Game

HABITAT SECTION
Southcentral Regional Office

333 Raspberry Road
Anchorage, Alaska
Main: 907.267.2342
Fax: 907.267.2499

SPECIAL AREA PERMIT FH21-II-0112-SA

ISSUED: October 29, 2021
EXPIRES: December 31, 2026

Anchorage Water & Wastewater Utility
Attn: Will O'Malley
3000 Arctic Boulevard
Anchorage, AK 99503

RE: Access Road Rehabilitation and Construction
Anchorage Coastal Wildlife Refuge
Section 15, T 12 N, R 4 W, SM
Location: 61.1301 N, 149.9596 W

Dear Mr. O'Malley:

Pursuant to 5 AAC 95, the Alaska Department of Fish and Game (ADF&G), Habitat Section has reviewed your proposal to reestablish a sewer force main maintenance access drive and construct a trunk access ramp within the Anchorage Coastal Wildlife Refuge (ACWR).

Project Description
You propose to construct about 1,200 feet of access drive and re-establish the historic maintenance access route for the Anchorage Water & Wastewater Utility Pump Station 12 sewer force mains. The access route is overgrown with woody vegetation and is no longer useable for heavy equipment and maintenance vehicles. In addition to the main access drive rehabilitation, an access ramp will be constructed on the south side of Pump Station 12 to access the Turnagain Trunk Sewer (Figure 2). This work is associated with the Pump Station 12 Rehabilitation Project (FH21-II-0111-SA).

The access drive routes will be prepared using a tracked excavator and off-road dump truck. Fabric will be placed on the subgrade, followed by base material and gravel that will be graded using a small bulldozer and grader. Topsoil will be spread over the gravel drive and revegetated using salvaged vegetative mat wherever possible and supplemented by reseeding with a seed mix

approved by the Plant Materials Center. The site will be monitored for five years after construction to ensure revegetation and stability are maintained and succeeding.

Legislatively Designated Special Area
The Anchorage Coastal Wildlife Refuge was established pursuant to AS 16.20.031(a) to protect waterfowl, shorebirds, salmon, ad other fish and wildlife species and their habitat, and for the use and enjoyment of the people of Alaska. Alaska statutes and the ACWR Management Plan policies allow for multiple land use activities within the refuge to be authorized by Special Area Permit if the activity provides for the proper protection of fish and wildlife resources. The proposed activity is not expected to adversely impact habitat values or fish and wildlife populations provided the stipulations contained herein is adhered to.

In accordance with 5 AAC 95, your project is approved subject to the project description, the following stipulation, and the permit terms.

1. Intentional harassment, disturbance, or displacement of wildlife is prohibited.

2. All waste or refuse shall be removed from the ACWR. No waste materials including food, trash, refuse, or other items shall be burned, discarded, abandoned, or otherwise disposed of on lands or waters within the ACWR. Food and refuse shall be stored in a manner that does not attract wildlife and prevents wildlife from accessing it.

3. Fuel, oil, or any other petrochemical products shall not be stored, and vehicles and equipment shall not be refueled within the ACWR. No vehicles or equipment leaking fuels, oils, hydraulic, or cooling fluids shall be operated within the ACWR.

4. Except for temporary restrictions to provide safety exclusion zones around equipment and truck activities, the project shall not unreasonably restrict or interfere with public access to or use of state land, or to fish and wildlife resources.

5. Annual monitoring reports on site revegetation status, including photographs and site descriptions, shall be provided to the ADF&G Habitat Section. Monitoring reports shall be submitted by November 1st each year from 2022 through 2026.

6. If monitoring indicates that revegetation failure, subsidence, or erosion attributable to the project has occurred at the project site, additional restoration work may be required and appropriate mitigation measures shall be determined in consultation with ADF&G Habitat.

7. The ADF&G Habitat Section shall be notified by phone (267-2342) or email (dfg.hab.infoanc@alaska.gov) a minimum of 7 days prior to beginning activities authorized by this permit.

Permit Terms
This letter constitutes a permit issued under the authority of AS 16.20.060 and must be retained on site during project activities. Please be advised that this determination applies only to

activities regulated by the Habitat Section; other agencies also may have jurisdiction under their respective authorities. This determination does not relieve you of your responsibility to secure other permits; state, federal, or local. You are still required to comply with all other applicable laws.

You are responsible for the actions of contractors, agents, or other persons who perform work to accomplish the approved project. For any activity that significantly deviates from the approved plan, you shall notify the Habitat Section and obtain written approval in the form of a permit amendment before beginning the activity. Any action that increases the project's overall scope or that negates, alters, or minimizes the intent or effectiveness of any provision contained in this permit will be deemed a significant deviation from the approved plan. The final determination as to the significance of any deviation and the need for a permit amendment is the responsibility of the Habitat Section. Therefore, we recommend you consult the Habitat Section immediately before considering any deviation from the approved plan.

You shall give an authorized representative of the state free and unobstructed access to the permit site, at safe and reasonable times, for the purpose of inspecting or monitoring compliance with any provision of this permit. You shall furnish whatever assistance and information the authorized representative reasonably requires for monitoring and inspection purposes.

In addition to the penalties provided by law, this permit may be terminated or revoked for failure to comply with its provisions or failure to comply with applicable statutes and regulations. You shall mitigate any adverse effect upon fish or wildlife, their habitats, or any restriction or interference with public use that the commissioner determines was a direct result of your failure to comply with this permit or any applicable law.

You shall indemnify, save harmless, and defend the department, its agents, and its employees from any and all claims, actions, or liabilities for injuries or damages sustained by any person or property arising directly or indirectly from permitted activities or your performance under this permit. However, this provision has no effect if, and only if, the sole proximate cause of the injury is the department's negligence.

Pursuant to 5 AAC 95.920, an interested person may initiate an appeal of a decision made under this chapter in accordance with the provisions of AS 44.62.330 - 44.62.630 by requesting a hearing under AS 44.62.370.

Questions about this permit may be directed to Habitat Biologist Scott Graziano at 267-2143 or scott.graziano@alaska.gov.

Sincerely,
Doug Vincent-Lang
Commissioner

By Ron Benkert
Southcentral Regional Supervisor

Enclosures: Figure 2. Project Site Plan

Email cc:
A. Ott, ADF&G-HAB
J. Baumer, ADF&G-SF
D. Battle, ADF&G-WC
J. Meehan, ADF&G-WC
T. Massie, ADF&G-HAB
C. Larson, ADNR DMLW
USACE, Regulatory
AWT, Anchorage

Figure 2 (r3) - PROJECT SITE PLAN

0 200'

MUNICIPALITY OF ANCHORAGE, ALASKA

VEI Consultants

APPLICANT: AWWU		DATE:	5/28/21
WATERWAY: Campbell Creek		GRID:	SW2525
PROPOSED ACTIVITY: Stream Undercrossing		SHEET NO:	2 of 7

ALASKA DEPARTMENT OF NATURAL RESOURCES
Division of Mining, Land, and Water
Water Resources Section
550 West 7th Avenue, Suite 1020, Anchorage, AK 99501-3562

TEMPORARY WATER USE AUTHORIZATION
TWUA A2021-35

Pursuant to AS 46.15, as amended and the rules and regulations promulgated thereunder, permission is hereby granted to Anchorage Water and Wastewater Utility (hereinafter authorization holder), 3000 Arctic Boulevard, Anchorage, Alaska 99503 and its contractors, **to divert the entire stream flow and dewatering as described below from December 1, 2021 through March 31, 2022**. Water use is associated with the Pump Station 12 Rehabilitation Project in Anchorage. The current sewer force mains follow a path east from AWWU Pump Station 12 across Campbell Creek above two 8' diameter culverts, then north toward Dimond Blvd. The project will reroute the sewer mains to pass beneath Campbell Creek about 50' downstream of the current location. After the new section of sewer main is constructed, the decommissioned section and the two culverts in Campbell Creek within easement ADL 45524 will be removed. Work is expected to occur between December 2021 and February 2022, to ensure the ground is frozen and adequate snow cover is present to protect vegetation at the site. The exact work window will be selected based on the tide cycles to allow work to occur during a period of lower tidal fluctuation. This project is within the Anchorage Coastal Wildlife Refuge (ACWR).

SOURCE(S) OF WATER:

Campbell Creek and the worksite in Section 15, Township 12 North, Range 4 West, Seward Meridian. Temporary diversion of the entire flow of Campbell Creek around the worksite located downstream of Campbell Lake.

ADVISORY

This project is within LAS 11981, a reservation of water issued to ADF&G for Campbell Creek. Please see Conditions 12 and 20.

STRUCTURES TO BE CONSTRUCTED AND USED:

As described in the application materials and ADF&G Special Area Permit:

Prior to the trench excavation, installation of new pipe or culvert removal, a steel pipe bypass flume will be installed. Ice will be removed from the excavation area to expose the ground, and riprap from the outlet of the culverts will be removed. A 50'x60" diameter steel pipe will be placed at the outlet of the east culvert, serving as a bypass flume to convey stream flow through the work site and discharge downstream. The west culvert will be sealed at the inlet with super sacks and sandbags to divert flow into the east culvert and temporary flume. Silt fencing will be installed upstream of the flume discharge to limit backwatering into the trench excavation area.

Creek Under-Crossing
Upon completion of the bypass flume, trench excavation will begin. Excavation will start from the center of the stream channel and work toward the banks. The trench is expected to be up to 50' wide to accommodate the required depth of 20', which will place the new force main pipes 8'-10' below the streambed. After the proper grade is reached, the preassembled pipes will be pulled into the trench, floated beneath the flume, and filled with water. Once pipes are aligned, concrete horseshoe anchors will be placed to sink the pipes side-by-side to the bottom of the trench. After confirming alignment, a manhole assembly will be placed on the west end of the pipes, and the trench will be backfilled and compacted to match the existing grade of Campbell Creek. The bypass flume will then be removed.

Culvert Removal
After removing the bypass flume, the remaining riprap, decommissioned force main sections, and culverts will be removed from Campbell Creek, and the streambanks will be reconstructed to match the upstream and downstream elevations.

Streambank Rehabilitation and Site Revegetation
All streambank rehabilitation at the culvert site and the under-crossing site will be performed to return the site to as close to pre-construction conditions as possible. Riprap may be used to backfill and rebuild the streambanks, but no riprap will be visible above the existing mudline in Campbell Creek. All disturbed areas above the existing mudline will be covered with native material and revegetated using salvaged vegetative mat from the site that was harvested with a thickness of at least 18". Any disturbed areas within ACWR that cannot be stabilized using salvaged vegetative mat will be revegetated under guidance from the Plant Materials Center using native species and their recommended methods. Rehabilitation work will be monitored for five years after construction to ensure revegetation and stability are maintained and succeeding.

Changes in the natural state of water are to be made as stated herein and for the purposes indicated.

The authorization holder shall comply with the following conditions:

CONDITIONS:

1. This authorization does not authorize the authorization holder to enter upon any lands until proper rights-of-way, easements or permission documents from the appropriate landowner have been obtained.

2. Follow acceptable engineering standards in exercising the privilege granted herein.

3. Comply with all applicable laws, and any rules and/or regulations issued thereunder.

4. Except for claims or losses arising from negligence of the State, defend and indemnify the State, the State's agents and the State's employees against and hold each of them harmless from any and all claims, demands, suits, loss, liability and expense, including attorney fees, for injury to or death of persons and damages to or loss of property arising out of or connected with the exercise of the privileges covered by this authorization.

5. Notify the Water Resources Section upon change of address.

6. The authorization holder is responsible for obtaining and complying with other permits/approvals (state, federal, or local) that may be required prior to beginning activities pursuant to this authorization including, but not limited to, fish habitat permits from the Alaska Department of Fish and Game (ADF&G) Habitat Division and any landowner or agency.

7. The authorization holder shall allow an authorized representative of the Water Resources Section to inspect at reasonable times any facilities, equipment, practices or operators regulated or required under this authorization.

8. Failure to respond to a request for additional information during the term of the authorization may result in the termination of this authorization.

9. This authorization, or a copy thereof, shall be kept at the site of the authorized project described herein. The authorization holder is responsible for the actions of contractors, agents or other persons who perform work to accomplish the approved project and shall ensure that workers are familiar with the requirements and conditions of this authorization. For any activity that significantly deviates from the approved project during its siting, construction or operation, the authorization holder is required to contact the Water Resources Section and obtain approval before beginning the activity.

10. The Water Resources Section may modify this authorization to include different limitations, expand monitoring requirements, evaluate impacts or require restoration at the site.

11. Any false statements or representations in any application, record, report, plan or other document filed or required to be maintained under this authorization may result in the termination of this authorization.

12. Pursuant to 11 AAC 93.220(f), this authorization may be suspended or terminated by the Department of Natural Resources to protect the water rights of other persons or the public interest.

13. All waste or refuse shall be removed from the project area. No waste materials including food, trash, refuse or other items shall be burned, discarded, abandoned or otherwise disposed of in any water body.

14. Operations shall be conducted in such a way as to prevent any petroleum products or hazardous substances from contaminating surface or ground water. No vehicles or equipment leaking fuels, oils, hydraulic, or cooling fluids shall be operated within the project area. In case of accidental spills, absorbent pads and spill response kits shall be readily available. Appropriate disposal methods for waste products shall be followed.

15. Fuel, oil, or any other petrochemical products shall not be stored, and vehicles and equipment shall not be refueled within the ACWR. The approval of ADF&G must be secured prior to a request to DNR-Water to amend this condition. Outside of the ACWR, pumps will not be fueled or serviced within 100 feet of a pond, lake, stream, river or other water body unless the pumps are situated within a catch basin designed to contain any spills. Vehicles will not be fueled or serviced within 100 feet of a pond, lake, stream, river or other water body. Equipment shall not be stored or serviced within 100 feet of any water body.

16. Operations shall not cause or contribute to the spread of preexisting or authorization holder caused contaminate plumes. All spills and contamination encountered must be immediately reported to the Alaska Department of Environmental Conservation (ADEC) and the Alaska Department of Natural Resources (DNR). DNR will be notified by email to dnr.twua@alaska.gov and dnr.scro.spill@alaska.gov. Authorization holder shall cooperate with lawful prohibitions, restrictions, instructions, stop work orders or work plan requirements issued by ADEC for authorization holder's projects.

17. All equipment used at or adjacent to water bodies must always be clean and free from contamination and invasive species (terrestrial and aquatic) to prevent the introduction of contamination and invasive species to the water body. Take particular care to ensure hoses, drafts and screens are clean. This will reduce the potential for introduction and spread of non-native terrestrial species and aquatic species such as Elodea sp.

18. Except as described in the application materials: if banks, shores or beds are inadvertently disturbed, excavated, compacted or filled by activities attributable to this project, they shall be immediately stabilized to prevent erosion and resultant sedimentation of water body which could occur both during and after operations. The Water Resources Section is to be notified immediately if the above occurs. Additional corrective action may be required by DNR and the land manager/owner.

19. Except for temporary restrictions to provide safety exclusion zones around equipment and truck activities, the project shall not unreasonably restrict or interfere with public access to navigable or public water.

20. Except as described in the application materials, issuance of this authorization does not give the authorization holder the right to block or dam a water course.

21. Water discharge (including runoff) shall not be discharged at a rate or location resulting in sedimentation, erosion, hazards within adjacent or nearby properties, road rights-of-way, storm drain, sanitary sewer systems or other disruptions to the bed or banks of water bodies.

22. Intentional harassment, disturbance, or displacement of wildlife is prohibited.

23. Except as described in the application materials and Special Use Permit, there shall be no wheeled, tracked, excavating, or other machinery or equipment operated below the ordinary highwater line to facilitate water withdrawal or diversion pursuant to this authorization.

24. Deviations from the project description submitted with the application which affect water amounts, season of use, capacity, flow, operation or point of discharge/diversion must be approved by the Water Resources Section in writing prior to implementation.

25. Silt fencing or other suitable containment techniques must be used, as necessary, to minimize the introduction of suspended solids into flowing waters.

26. The stream reach downstream of the project area shall be supplied with a constant flow of clean water sufficient to support the aquatic life in the stream and maintain fish passage downstream of the work area.

27. A diversion channel/structure, new stream channel or culvert (either temporary or permanent) must be capable of carrying anticipated stream flows and designed, installed and maintained to accommodate the efficient passage and movement of fish, both upstream and downstream.

28. Record and immediately report to this office all complaints relating to pumping/diversion activities and discharge, including requests for information from residents, should the situation occur.

29. Only water use is being authorized with this authorization. No ground disturbance, clearing, mulching, mowing, rutting or other land use can occur in conjunction with the activities in this authorization without the express approval of the land manager/owner.

30. Monitoring reports required by ADF&G under Special Area Permit FH21-II-0111-SA will be submitted to DNR-Water electronically to dnr.twua@alaska.gov.

31. If monitoring indicates that revegetation failure, subsidence, or erosion attributable to the project has occurred at the project site, additional restoration work may be required, and appropriate mitigation measures shall be determined in consultation with ADF&G Habitat and DNR-Water.

32. If minor dewatering occurs, water will be discharged to vegetated uplands at least 100’ from water surfaces (to allow it to naturally filter) or a sediment tank will be used prior to discharge back into Campbell Creek. At no time will water containing sediment be discharged directly to a water source.

33. Any project in fish bearing waters must conform to any season of use, fish window, notification requirement or other stipulation established by the Alaska Department of Fish and Game.

34. Per 11 AAC 05.260(e), an annual administrative service fee shall be assessed on this authorization.

This Temporary Water Use Authorization is issued pursuant to 11 AAC 93.220. No water right or priority is established by a temporary water use authorization issued pursuant to 11 AAC 93.220. Water so used is subject to appropriation by others (11 AAC 93.210 (b)).

Pursuant to 11 AAC 93.210 (b), authorized temporary water use is subject to amendment, modification or revocation by the Department of Natural Resources if the Department of Natural Resources determines that amendment, modification or revocation is necessary to supply water to lawful appropriators of record or to protect the public interest.

This authorization shall expire on March 31, 2022.

Date issued: November 18, 2021

Approved: Meghan O'Brien

Meghan O'Brien
Manager, Water Resources Section

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 SEWER IMPROVEMENTS

PUMP STATION 12 FORCE MAIN / INTERCEPTOR C GRAVITY JUNCTION REHABILITATION

SECTION XVI

COMMUNITY WORKFORCE AGREEMENT

(NOT USED)

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 SEWER IMPROVEMENTS

PUMP STATION 12 FORCE MAIN / INTERCEPTOR C GRAVITY JUNCTION REHABILITATION

SECTION XVII

ANNOTATED SITE PHOTOS

(NOT USED)

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 SEWER IMPROVEMENTS

PUMP STATION 12 FORCE MAIN / INTERCEPTOR C GRAVITY JUNCTION REHABILITATION

SECTION XVIII

HAZARDOUS MATERIALS SURVEY REPORT

SECTION 00230

HAZARDOUS MATERIALS SURVEY REPORT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. The Hazardous Materials Survey Report for the proposed construction is included with these Contract Documents.

1.02 USE OF INFORMATION

A. The Hazardous Materials Survey Report is provided for the Contractor's information and use in the planning and performance of work in areas containing hazardous or potentially hazardous materials as outlined in Paragraph 1.03.

1. The information provided in the Hazardous Materials Survey Report is based on samples collected in various locations of the building. Thus, the Owner and/or its Representative cannot guarantee or warrant that actual conditions encountered might not vary from the information presented in these reports.
2. The data reported in the Hazardous Materials Survey Report is accurate to the best of the Owner's and it's Representative's knowledge. The requirements contained in these specifications and in the relevant state and federal regulations pertaining to the performance of work in areas containing hazardous or potentially hazardous materials provide guidance for the contractor for performance of work in these areas. The Owner and its Representative disclaim all responsibility for the Contractor's erroneous conclusions regarding the information presented in these reports; the requirements contained in these specifications; and the requirements of applicable state and federal regulations pertaining to performance of work in these areas.
3. The Contractor shall be responsible for obtaining additional information if Contractor deems it necessary to carry out the work.

B. It is highly recommended that the contractor visit the site to acquaint themselves with existing conditions.

C. Attached Hazardous Materials Survey Report

1.03 NOTIFICATION OF POTENTIAL HAZARDS

A. Asbestos, lead and other hazardous materials are present in the building that may impact the work of all trades. Regulated air contaminants, including asbestos and lead, are assumed to be present in settled and concealed dust in and on architectural, structural, mechanical and electrical components or systems throughout the building. All trades shall coordinate with other trades and conduct

their work to prevent worker exposure or site contamination. Refer to specification Section 01561, Airborne Contaminant Control and Division 13 specifications for specific information concerning disturbing, removing and disposing of these materials and the installation of new materials or components. This notification is provided in accordance with EPA and OSHA requirements.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

HAZARDOUS MATERIALS SURVEY REPORT

AWWU PUMP STATION 12 LEAD AND ASBESTOS SURVEY

ANCHORAGE, ALASKA

Surveyed
July 12, 2011

Report Date
July 26, 2011

EHS-ALASKA, INC.
ENGINEERING, HEALTH & SAFETY CONSULTANTS
11901 BUSINESS BLVD., SUITE 208
EAGLE RIVER, ALASKA 99577-7701

HAZARDOUS MATERIALS SURVEY REPORT

AWWU PUMP STATION 12 LEAD AND ASBESTOS SURVEY

ANCHORAGE, ALASKA

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APPENDICES

Appendix A ..... Asbestos Bulk Field Survey Data Sheets and Lab Reports
Appendix B ..... Lead Analyzer Test Results
Appendix C ..... Drawings of Sample Locations

HAZARDOUS MATERIALS SURVEY REPORT

AWWU PUMP STATION 12 LEAD AND ASBESTOS SURVEY

ANCHORAGE, ALASKA

OVERVIEW

A limited survey was conducted for the Anchorage Water and Wastewater Utilities (AWWU) in Pump Station 12, located in Anchorage, Alaska. This survey was limited to sampling of various flange gaskets and lead based paint testing as a part of the design services for the Pump Station 12 Valve & Pump Replacement project for AWWU. The survey also provided a "good faith" inspection for hazardous materials that may be disturbed during the construction. The proposed work includes the disturbance, demolition, removal and disposal of lead-containing paints and/or lead-containing materials that is incidental to the renovation and remodeling project. Mr. Martin J. Lindeke and Mr. Stephen E. Littlejohn of EHS-Alaska, Inc. (EHS-Alaska) conducted the inspections in July 2011.

A. GENERALIZED REQUIREMENTS FOR HAZARDOUS MATERIALS

Potentially hazardous materials have been identified in Pump Station 12 that will be affected by this project. Lead based paints were identified in the building and will be affected by this project. Other Potentially hazardous materials may exist in this facility that is outside of this project and therefore was not included in this survey. Other potentially hazardous materials, exterior to the building, such as contamination from underground fuel tanks may also be present, but are also not part of this report.

Buildings or portions of buildings that were constructed prior to 1978 which are residences, or contain day care facilities, kindergarten classes or other activities frequently visited by children under 6 years of age are classified as *child occupied facilities*. All work disturbing more than 6 square feet of lead-based painted surfaces per room for interior activities or more than 20 square feet for exterior activities in child occupied facilities must comply with the requirements of 40 CFR 745. This building is not classified as a *child occupied facility* and therefore the requirements of 40 CFR 745 are not applicable.

Only the materials that will be directly affected by this project are required to be removed. The quantities and types of materials are incorporated into the design documents for this renovation. The removal and disposal of potentially hazardous materials are highly regulated, and it is anticipated that asbestos, lead and chemical hazards removal and disposal will be conducted by a subcontractor to the general contractor who is qualified for such removal. It is anticipated that the general contractor and other trades will be able to conduct their work using engineering controls and work practices to control worker exposure and to keep airborne contaminants out of occupied areas of the building. Refer to Section 01561, Airborne Contaminant Control.

Settled and concealed dusts in areas not subject to routine cleaning are present throughout the building, including the roof, and inside and on top of architectural, mechanical, electrical, and structural elements, and those dusts are assumed to contain regulated air contaminants. This should not be read to imply that there is an existing hazard to building occupants (normal occupants of the building as opposed to construction workers working in the affected areas). However, depending on the specific work items involved and on the means and methods employed when working in the affected areas, construction workers could be exposed to regulated air contaminants from those dusts in excess of the OSHA Permissible Exposure Limits (PELs).

The settled and concealed dusts were examined by an EPA Certified Building Inspector but were not sampled. The inspector determined that the dusts are not "asbestos debris" from an asbestos-containing building material (ACBM). Based on similar sampling from similar buildings, the inspector also determined that the dusts are unlikely to contain more than one percent (1%) asbestos by weight, and therefore are not an asbestos-containing material (ACM). Reference 40 CFR 763.83.

"Awareness training" (typically 2 hours) and possibly respiratory protection will be required for all Contractor Personnel who will be disturbing the dusts. The extent of the training and protective measures will depend upon the airborne concentrations measured during air monitoring of the contractors work force, which depends on the means and methods employed to control the dusts. The air monitoring may be discontinued following a "negative exposure assessment" showing that worker exposures are below the OSHA permissible exposure limits for the type of work and means and methods employed. Previous air monitoring from similar jobs with similar conditions may be used as historical data to establish a "negative exposure assessment".

B. BUILDING DESCRIPTION

Pump Station 12 was originally constructed in 1972 with various upgrade and repairs through the years. The building is a multi level building constructed of concrete and houses various pumps and valves and associated electrical equipment.

C. SAMPLING AND ANALYSIS

1. Asbestos-Containing Materials

The focus of this survey was to sample suspect ACM gaskets. No other suspect asbestos-containing materials were sampled.

The samples were analyzed for the presence of asbestos by polarized light microscopy (PLM), the method of analysis recommended by the U.S. Environmental Protection Agency (EPA) to determine the composition of suspected asbestos-containing materials (EPA method 600/M4-82-020). Only materials containing more than 1% total asbestos were classified as "asbestos-containing" based on EPA and the Occupational Safety and Health Administration (OSHA) criteria. Samples that were analyzed to have less than 10% asbestos were "point-counted" by the laboratory for more accuracy. Samples that are listed as having a "Trace by Point Count" had asbestos fibers found in the material, but the fibers were not present at the counting grids. Table 1 in Part D below contains a summary list of the asbestos bulk samples and the applicable results.

Field survey data sheets and laboratory reports of the bulk samples are included in Appendix A. Drawings showing sample locations are included as Appendix C.

2. Lead-Containing Materials

Nearly all surfaces in the building were coated with paint and most surfaces had been repainted. EHS-Alaska tested paint throughout the affected areas of the building using a XLi303AW X-Ray Fluorescence (XRF) lead paint analyzer (Serial # 14311 with software version 5.1CDual). Refer to the Lead Paint Screening Table in Appendix B that identifies the surfaces tested, and the results. The Paint Test Locations are shown in Appendix C.

EPA and the Department of Housing and Urban Development (HUD) have defined lead-based paint as any paint or other surface coating that contains lead equal to or in excess of 1.0 milligram per square centimeter (mg/cm^2) or 0.5 percent by weight. XRF results are classified as positive (lead is present at 1.0 mg/cm^2 or greater), negative (less than 1.0 mg/cm^2 of lead was present) or inconclusive (the XRF could not make a conclusive positive or negative determination). Tests that were invalid due to operator error are shown as void tests.

A Performance Characteristic Sheet (PCS) for the NITON XLi303AW is available upon request. This PCS data provides supplemental information to be used in conjunction with Chapter 7 of the "HUD Guidelines". Performance parameters provided in the PCS are applicable when operating the instrument using the manufacturer's instructions and the procedures described in Chapter 7 of the "HUD Guidelines". The

instrument was operated in accordance with manufacturer's instructions and Chapter 7 of the HUD Guidelines. No substrate correction is required for this instrument. There is no inconclusive classification for this instrument when using the 1.0 mg/cm^2 threshold.

D. SURVEY RESULTS

1. Asbestos-Containing Materials

Asbestos field survey data sheets and laboratory reports are included as Appendix A. Refer to Appendix C for sample locations. The following TABLE 1 lists the samples taken in July 2011, and the results of the laboratory analysis.

TABLE 1

SAMPLE NUMBER	*MATERIAL*	*LOCATION*	*ASBESTOS CONTENT*
AWWU-0711-A01	Gasket, red, rubber	Level 2, knife gate flange on valve 2	None Detected
AWWU-0711-A02	Gasket, grey	Level 2, flange on discharge pipe 1 at knife gate	None Detected
AWWU-0711-A03	Gasket, black	Level 3, flange on discharge pipe 4 at knife gate	None Detected
AWWU-0711-A04	Gasket, black	Level 3 on discharge pipe 1	None Detected
AWWU-0711-A05	Gasket, green board	Level 4 on discharge 4 at knife gate	None Detected
AWWU-0711-A06	Gasket, black	Level 4 at ball valve on discharge pipe 1	None Detected
AWWU-0711-A07	Gasket, green	Level 4 at pipe 1 flange at knife gate	None Detected
AWWU-0711-A08	Gasket, black	Level 4 at pipe 1 flange joining ball valve	None Detected
AWWU-0711-A09	Gasket, black	Level 4 at pipe 1 ball valve	None Detected
AWWU-0711-A10	Gasket, red, rubber	Level 2 at underside of discharge pipe, below knife gate valve 2	None Detected
AWWU-0711-A11	Paper gasket, white with green backing	Level 4, pump motor 4	None Detected
AWWU-0711-A12	Paper gasket, white with green backing	Level 4, pump motor 1	None Detected
AWWU-0711-A13	Flange gasket, black	Level 3, discharge pipe 3 flange at knife gate	None Detected
The testing method used (polarized light microscopy [PLM]) is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. Before this material can be considered or treated as non-asbestos containing, confirmation should be made by quantitative transmission electron microscopy (TEM).			

No asbestos-containing gaskets were identified in the project area. Because not all of the flange gaskets were available to test, if any gaskets are encountered that appear different from those described here, it is recommended that they be assumed to contain asbestos until samples and "proven" to be asbestos-free. Other materials in and on the building that were NOT sampled may contain asbestos. OSHA and EPA regulations require that materials be sampled prior to disturbance or that they be assumed to contain asbestos.

2. Asbestos in Dusts

The settled and concealed dusts were examined by an EPA Certified Building Inspector but no samples for asbestos in dusts were authorized for this project. Based on their visual inspection and experience from similar buildings, the inspector determined that the typical settled and concealed dusts are not "asbestos debris" from an asbestos-containing building material (ACBM). Based on similar sampling from similar buildings, the inspector also determined that the dusts are unlikely to contain more than one percent (1%) asbestos by weight, and therefore are not an asbestos-containing material (ACM).

3. Lead-Containing Materials

Lead-Testing
EHS-Alaska tested paint throughout the affected areas of the building using a NITON XLi303AW X-Ray Fluorescence (XRF) lead paint analyzer (Serial # 14311 with software version 5.1CDual). Lead in paints tested varied from a trace amount to 9.0 mg/cm^2. Refer to the Lead Paint Screening Table in Appendix B that identifies the surfaces tested, and the results. The Paint Test Locations are shown in the Drawings in Appendix C.

Paints
There were varying lead contents found in the paints, based on what surfaces they are on, with most surfaces containing little lead (but are still classified as lead-containing materials by OSHA). The highest levels of lead were found on the original pipes and valves, with lower levels on walls and other painted surfaces. In general, if the pipes were shown on the original as-built drawing, they had lead-based paint.

Lead based paints (paint containing more than 1.0 mg/cm^2 of lead) were identified in the project on pipes and valves. Lead was detected at very low levels in most of the painted floor, wall and ceiling surfaces. Low levels of lead found by XRF testing does not mean that the paints are free of lead, the paints may contain lead. However, these paints should not present a hazard to occupants or workers performing renovation or demolition if lead-safe work practices are followed.

Metallic Lead in Batteries, Pipe Solder and Flashing
Metallic lead items identified in the building included the lead solder at copper piping and lead acid batteries in emergency lights and other battery backup equipment. If removed during renovation or demolition they should be recycled or disposed of as hazardous waste.

4. PCB-Containing Materials

Light Ballasts
Older fluorescent lights typically have PCB-containing ballasts. PCB-containing ballasts in fluorescent lights were banned in 1978, but manufacturers were allowed to use up existing stocks, and lights may have been reused from other facilities. The scope of work did not include inspection of lights for PCB ballasts. All lights shall be inspected during removal. Unless ballasts were marked "No PCBs," they must be assumed to contain PCBs and must be disposed of as a hazardous waste when removed for disposal.

Older HID lights may have PCB-containing ballasts. The scope of work did not include inspection of lights for PCB ballasts. All HID lights shall be inspected during removal or relocation. If ballasts are not marked "No PCBs," we suggest contacting the manufacturer of the lights to determine if the ballasts contain PCB's, or assume that they contain PCB's and be disposed of as a hazardous waste.

5. Mercury-Containing Materials

Fluorescent Lamps
Fluorescent lamps use mercury to excite the phosphor crystals that coat the inside of the lamp. These lamps contain from 15 to 48 milligrams of mercury depending on their age and manufacturer. No fluorescent light fixtures are scheduled to be replaced by this project.

High Intensity Discharge Lamps
High Intensity Discharge (HID) lamps use mercury and sodium vapors in the lamp, and also typically have lead-containing solders at the bases. These lamps contain varying amounts of mercury depending on their age and manufacturer. No HID light fixtures are scheduled to be replaced by this project.

Float and Limit Switches
Float and limit switches are often manufactured with liquid mercury ampules. The float and limit switches were sealed, and should be assumed to contain mercury if they will be disturbed by this project.

All mercury-containing items being removed by this project are required to be disposed of as hazardous waste or recycled.

6. Other Hazardous Materials

Self-Illuminating Exit Signs
Several radioactive smoke detectors were found in the renovation area. No radioactive smoke detectors are scheduled to be replaced by this project.

Soil Contamination
The scope of work for EHS-Alaska, Inc. did not include investigation of soils for petroleum or other contaminations.

E. REGULATORY CONSTRAINTS

1. Asbestos-Containing Materials

The Federal Occupational Safety and Health Administration (29 CFR 1926.1101) and the State of Alaska Department of Labor (8 AAC 61) have promulgated regulations requiring testing for airborne asbestos fibers; setting allowable exposure limits for workers potentially exposed to airborne asbestos fibers; establishing contamination controls, work practices, and medical surveillance; and setting worker certification and protection requirements. These regulations apply to all workplace activities involving asbestos-containing materials.

The disposal of asbestos waste is regulated by the EPA, the Alaska Department of Environmental Conservation, and the disposal site operator. Wastes being transported to the disposal site must be sealed in leak tight containers prior to disposal and must be accompanied by disposal permits and waste manifests.

2. Dusts with Asbestos

Settled and concealed dusts above ceilings, and at other areas that are not routinely cleaned (such as inside ducts and at roofs, etc.) are assumed to have measurable concentrations of asbestos. Based on sampling of similar settled and concealed dusts at similar buildings, those dusts are assumed to contain less than 1 percent asbestos. Normal settled and concealed dusts are distinct and treated differently from debris resulting from damaged asbestos-containing materials.

Background levels of asbestos in dusts for a particular location will depend on many factors, including whether or not asbestos occurs naturally in soils in the area.

Likely sources of asbestos in dusts include natural occurrences of asbestos

The types of asbestos found in settled and concealed dusts often contain actinolite, anthophylite, and tremolite forms of asbestos which are not commonly found in bulk samples taken of materials from buildings. Those forms of asbestos may come from natural occurrences of asbestos in an outside source, such as rock or ore deposits, which appear to be common in the Anchorage area.

Because the type of disturbance, concentration of asbestos in the dusts, cohesiveness of the dusts and room sizes will change, the airborne asbestos levels expected during the project will depend on the contractor's means and methods of conducting the work. The mere presence of asbestos in the dusts does not necessarily imply that a "hazard" exists which would require the use of specially trained workers to "abate" the "hazard". All dusts will likely be required to be removed from the areas where asbestos-containing materials are being removed (abatement areas) in order to achieve clearances. The dusts in the other areas are to be controlled so as to limit worker exposures and prevent contamination of occupied areas of the building.

There is no established correlation between settled or adhered dusts with measureable concentrations of asbestos and airborne concentrations. The definition in the OSHA regulations of asbestos-containing materials as those materials that contain 1 percent or more asbestos by weight, apply to cohesive materials and not to dusts. The OSHA regulations are essentially "performance based", if workers are exposed above the permissible exposure limits, then all of the requirements in the regulations become effective.

3. Lead-Containing Materials

The EPA Standard 40 CFR 745, Lead-Base Paint Poisoning Prevention in Certain Residential Structures, defines lead–based paint hazards and regulates lead based paint activities in target housing and child-occupied facilities. The requirements of this regulation include training certification, pre-work notifications, work practice standards and record keeping. Areas typically classified as child occupied facilities may include but are not limited to: day care facilities, preschools, kindergarten classrooms, restrooms, multipurpose rooms, cafeterias, gyms, libraries and other areas routinely used by children under 6 years of age. New training requirements for Firms (Contractors) and Renovators (Workers) became effective on April 22, 2010. The building is not classified as a child occupied facility, therefore the requirements of 40 CFR 745 do not apply.

Federal OSHA (29 CFR 1926.62) and the State of Alaska (8 AAC Chapter 61) have promulgated regulations that apply to all construction work where employees may be exposed to lead. The disturbance of any surfaces painted with lead-containing paint requires lead-trained personnel, personnel protective procedures, and air monitoring until exposure levels can be determined. If initial monitoring verifies that the work practices being used are not exposing workers, monitoring and protection procedures may be relaxed. Experience has shown that some paints in most buildings will contain low concentrations of lead and disturbance of those paints are still regulated under the OSHA lead standard, 29 CFR 1926.62. Low levels of lead found by XRF testing does not mean that the paints are free of lead, the paints may contain lead, and OSHA regulations apply anytime measurable amounts of lead are present in paints.

Settled and concealed dust above ceilings, and at other areas that are not routinely cleaned are assumed to have measurable concentrations of lead. Background levels of lead in dusts for a particular location will depend on many factors, including whether or not engines utilizing leaded gasoline were run in or near a building, and upon the age of the building, and thus the age of the dusts. Because the type of disturbance, quantity of lead dusts, cohesiveness of the dusts and room sizes will change, the airborne lead levels expected during the project will depend on the contractor's means and methods of conducting the work. The mere presence of lead in the dusts does not necessarily imply that a "hazard" exists which would require the use of specially trained workers to "abate" the "hazard".

There is no established correlation between settled or adhered lead dust concentrations and airborne concentrations. The OSHA regulations are essentially "performance based", if workers are exposed above the permissible exposure limits, then all of the requirements in the regulations become effective.

The EPA requires that actual construction or demolition debris that contains lead or lead-containing paint or other heavy metals be tested using the TCLP to determine if the waste must be treated as hazardous waste. All federal, state and local standards regulating lead and lead-containing wastes are required to be followed during the renovation or demolition of portions of this building.

There are no hazardous waste landfills in Alaska and the lead-containing wastes (if shown to be hazardous waste) will have to be packaged for shipping and disposal. This report assumes that disposal will take place in Seattle or elsewhere in the Pacific Northwest.

4. PCB-Containing Materials

This survey did not include inspection for PCB-containing materials. If any PCB-containing materials are discovered and if they will be removed, the EPA has promulgated regulations (40 CFR Part 761) that cover the proper handling and disposal of PCB-containing equipment. All construction workers who are required to remove or handle PCB-containing or PCB-contaminated equipment or to transport or dispose of PCB wastes shall be trained and certified as required by the U.S. Department of Labor (29 CFR 1910.120) and the State of Alaska Department of Labor (8 AAC 61).

5. Mercury-Containing Materials

Thermostats, float and limit switches and mercury-containing lamps are classified by the EPA as Universal Wastes. The EPA encourages that all Universal Wastes be recycled in accordance with 40 CFR 273. Mercury and mercury-containing products are considered hazardous waste if TCLP testing of the waste for mercury confirms the mercury content to be greater than the EPA criteria of 0.2 mg/l.

6. Other Hazardous Materials

Radioactive Materials
There are special disposal requirements for products that contain Tritium, Krypton-85, or Promethium-147 that are generally licensed. Licensed radioactive products are regulated by Nuclear Regulatory Commission standard 10 CFR 20 and 10 CFR 32. Smoke detectors were present in the project area that may contain a radioactive material. If the detectors are of the ionization type they typically contain a small amount of Americium. If removed during renovation, the detectors should be returned to the owner for reuse or returned to the manufacturer for disposal or recycling. There are no licensed disposal facilities for radioactive wastes in Alaska.

F. RECOMMENDATIONS

1. Asbestos-Containing Materials

Asbestos containing materials were not identified in this survey. If any asbestos-containing materials that are identified or assumed and will be disturbed by the planned renovation work are required to be removed by trained asbestos workers. Refer to Section 13280 Asbestos Removal and Disposal.

2. Dusts with Asbestos

Dusts with measurable concentrations of asbestos are assumed to be present, but are not classified as asbestos-containing materials, or as debris from asbestos-containing materials. Workers disturbing dusts are required to have hazard communication training in accordance with OSHA regulations, but are not

required to receive 40 hours of training, which is required for asbestos workers. At least an initial exposure assessment or data from previous air monitoring is required to show that the contractor's chosen means and methods of controlling worker exposure to airborne contaminants below the OSHA permissible exposure limits (PELs) is required. Refer to Section 01561 Airborne Contaminant Control.

3. Lead-Containing Materials

Federal OSHA (29 CFR 1926.62) and the State of Alaska (8 AAC Chapter 61) have promulgated regulations that apply to all construction work where employees may be exposed to lead, including disturbance of paints with low concentrations of lead.

The EPA Standard 40 CFR 745, Lead-Base Paint Poisoning Prevention in Certain Residential Structures, defines lead–based paint hazards and regulates lead based paint activities in target housing and child-occupied facilities. Contractors disturbing lead-based paints in target housing and child occupied facilities must comply with 40 CFR 745.

Worker exposure to lead may be able to be controlled below the OSHA permissible exposure limit if proper engineering controls and procedures are used during renovation. Lead is a potentially hazardous waste and the EPA requires that all wastes that contains lead be tested to determine if they must be treated as hazardous waste. A TCLP test of the waste stream is required to be performed to determine if the waste will be hazardous or non-hazardous. Refer to Section 01561 Airborne Contaminant Control and Section 13281 Lead Removal and Disposal.

4. PCB-Containing Materials

If any PCB-containing ballasts are discovered, and they are removed or replaced, they will need to be removed, handled, packaged and disposed of in accordance with all regulations.

5. Mercury-Containing Materials

If any mercury-containing materials are removed or replaced, they will need to be removed, handled, packaged and disposed of in accordance with all regulations. If mercury-containing lamps are handled and disposed of in accordance with the Universal Waste Regulations, no TCLP test is required. If the Contractor chooses to perform a TCLP test of fluorescent lamps, the test shall be conducted in accordance with the requirements of TCLP testing of fluorescent lamps shall comply with ANSI/NEMA Standard Procedure for Fluorescent Lamp Sample Preparation and Toxicity Characteristic Leaching Procedure, C78.LL 1256-2003 or latest version. Refer to Section 13285 Chemical Hazards Removal and Disposal.

6. Other Hazardous Materials

If any radioactive materials are removed or replaced, they will need to be removed, handled, packaged and disposed of in accordance with all regulations. Refer to Section 13285 Chemical Hazards Removal and Disposal.

G. LIMITATIONS

The conclusions and recommendations contained in this report are based upon professional opinions with regard to the subject matter. These opinions have been arrived at in accordance with currently accepted environmental consulting and engineering standards and practices and are subject to the following inherent limitations:

1. Accuracy of Information

The laboratory reports utilized in this assessment were provided by the accredited laboratories cited in this report. Although the conclusions, opinions, and recommendations are based in part, on such information, our services did not include the verification of accuracy or authenticity of such reports. Should such information provided be found to be inaccurate or unreliable, EHS-Alaska, Inc. reserves the right to amend or revise its conclusions, opinions, and/or recommendations.

2. Site Conditions

This limited survey did not include investigation of the entire site and is not outside the materials sampled. The intent of this survey was to identify hazardous materials that may be disturbed this project. This survey is not intended to be utilized as the sole design document for abatement. This survey was conducted while the site was occupied. All inspections were performed with furniture, equipment and/or stored items in place. Although a concerted effort was made to identify all hazardous materials, some hazardous materials may have been hidden by furniture, equipment or stored items and may not have been identified. The survey investigated representative materials and items, such as lights and mechanical components. Variations may occur between materials and items that appear to be the same, but are actually of different construction or materials. Other asbestos-containing or potentially hazardous materials may be present in the facilities that were concealed by structural members, walls, ceilings or floor coverings.

3. Changing Regulatory Constraints

The regulations concerning hazardous materials are constantly changing, including the interpretations of the regulations by the local and national regulating agencies. Should the regulations or their interpretation be changed from our current understanding, EHS-Alaska, Inc. reserves the right to amend or revise its conclusions, opinions, and/or recommendations.

APPENDIX A

Asbestos Bulk Sample
Field Survey Data Sheets
and
Laboratory Reports

IATL **International Asbestos Testing Laboratories**

9000 Commerce Parkway Suite B Mt. Laurel, NJ 08054
Telephone: 856-231-9449 Fax: 856-231-9818

CERTIFICATE OF ANALYSIS

Client: EHS Alaska Incorporated
11901 Business Blvd., Ste 208
Eagle River AK 99577-7701

Report Date: 7/15/2011
Report No.: 246483
Project: AWWU PS12 Survey; PS12
Project No.: 7027-01

BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 4362488 **Description / Location:** Red Gasket
Client No.: AWWU-0711-A01 Level 2, Knife Gate Flange On Valve 2

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 4362489 **Description / Location:** Grey Gasket; Level 2, Flange
Client No.: AWWU-0711-A02 On Discharge Pipe 1 At Knife Gate

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	10	Cellulose	90

Lab No.: 4362490 **Description / Location:** Black Gasket; Level 3, Flange
Client No.: AWWU-0711-A03 On Discharge Pipe 4 At Knife Gate

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	15	Cellulose	85

Lab No.: 4362491 **Description / Location:** Black Gasket
Client No.: AWWU-0711-A04 Level 3 On Discharge Pipe 1

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	15	Cellulose	85

Accreditations: **NIST-NVLAP No. 101165-0** **NY-DOH No. 11021** **AIHA-LAP, LLC No. 100188**

Analytical Method EPA 600/R-93/116

Comments: (PC) Indicates Stratified Point Count Method performed. Method not performed unless stated. Quantification at <0.25% by volume is possible with this method. (PC–Trace) represents this limit of quantitation. (PC-Trace) means that asbestos was detected but is not quantifiable under the Point Counting regimen. Analysis includes all distinct separable layers in accordance with EPA 600 Method. If not reported or otherwise noted, layer is either not present or the client has specifically requested that it not be analyzed. Small asbestos fibers may be missed by PLM due to resolution limitations of the optical microscope. Therefore, negative PLM results cannot be guaranteed. Electron Microscopy can be used as a confirming technique. Regulatory Limit is based upon the sample matrix.

Analysis Performed By: B. Hargrove

Approved By:

Date: 7/15/2011

Frank E. Ehrenfeld, III
Laboratory Director

IATL **International Asbestos Testing Laboratories**

9000 Commerce Parkway Suite B Mt. Laurel, NJ 08054
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CERTIFICATE OF ANALYSIS

Client: EHS Alaska Incorporated
11901 Business Blvd., Ste 208
Eagle River AK 99577-7701

Report Date: 7/15/2011
Report No.: 246483
Project: AWWU PS12 Survey; PS12
Project No.: 7027-01

BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 4362492 **Description / Location:** Green/White Gasket
Client No.: AWWU-0711-A05 Level 4 On Discharge 4 At Knife Gate

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	40	Cellulose	60

Lab No.: 4362493 **Description / Location:** Black Gasket
Client No.: AWWU-0711-A06 Level4 At Ball Valve On Discharge Pipe 1

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	15	Cellulose	85

Lab No.: 4362494 **Description / Location:** Green Gasket
Client No.: AWWU-0711-A07 Level 4 At Pipe 1 Flange At Knife Gate

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	40	Cellulose	60

Lab No.: 4362495 **Description / Location:** Black Gasket; Level 4
Client No.: AWWU-0711-A08 At Pipe 1 Flange Joining Ball Valve

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	20	Cellulose	80

Accreditations: **NIST-NVLAP No. 101165-0** **NY-DOH No. 11021** **AIHA-LAP, LLC No. 100188**

Analytical Method EPA 600/R-93/116

Comments: (PC) Indicates Stratified Point Count Method performed. Method not performed unless stated. Quantification at <0.25% by volume is possible with this method. (PC–Trace) represents this limit of quantitation. (PC-Trace) means that asbestos was detected but is not quantifiable under the Point Counting regimen. Analysis includes all distinct separable layers in accordance with EPA 600 Method. If not reported or otherwise noted, layer is either not present or the client has specifically requested that it not be analyzed. Small asbestos fibers may be missed by PLM due to resolution limitations of the optical microscope. Therefore, negative PLM results cannot be guaranteed. Electron Microscopy can be used as a confirming technique. Regulatory Limit is based upon the sample matrix.

Analysis Performed By: B. Hargrove

Date: 7/15/2011

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CERTIFICATE OF ANALYSIS

Client: EHS Alaska Incorporated
11901 Business Blvd., Ste 208
Eagle River AK 99577-7701

Report Date: 7/15/2011
Report No.: 246483
Project: AWWU PS12 Survey; PS12
Project No.: 7027-01

BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 4362496 **Description / Location:** Black Gasket
Client No.: AWWU-0711-A09 Level 4 At Pipe 1 Ball Valve

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	20	Cellulose	80

Lab No.: 4362497 **Description / Location:** Red Gasket; Level 2 At Underside
Client No.: AWWU-0711-A10 Of DischargePipe, Below Knife GateVavle2

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 4362498 **Description / Location:** Brown/White Gasket
Client No.: AWWU-0711-A11 Level 4, Pipe Motor 4

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	80	Cellulose	15
		5	Wollastonite	

Lab No.: 4362499 **Description / Location:** Brown/White Gasket
Client No.: AWWU-0711-A12 Level 4, Pipe Motor 1

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	80	Cellulose	15
		5	Wollastonite	

Accreditations: **NIST-NVLAP No. 101165-0** **NY-DOH No. 11021** **AIHA-LAP, LLC No. 100188**

Analytical Method EPA 600/R-93/116

Comments: (PC) Indicates Stratified Point Count Method performed. Method not performed unless stated. Quantification at <0.25% by volume is possible with this method. (PC–Trace) represents this limit of quantitation. (PC-Trace) means that asbestos was detected but is not quantifiable under the Point Counting regimen. Analysis includes all distinct separable layers in accordance with EPA 600 Method. If not reported or otherwise noted, layer is either not present or the client has specifically requested that it not be analyzed. Small asbestos fibers may be missed by PLM due to resolution limitations of the optical microscope. Therefore, negative PLM results cannot be guaranteed. Electron Microscopy can be used as a confirming technique. Regulatory Limit is based upon the sample matrix.

Analysis Performed By: B. Hargrove

Date: 7/15/2011

IATL **International Asbestos Testing Laboratories**

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Telephone: 856-231-9449 Fax: 856-231-9818

CERTIFICATE OF ANALYSIS

Client: EHS Alaska Incorporated
11901 Business Blvd., Ste 208
Eagle River AK 99577-7701

Report Date: 7/15/2011
Report No.: 246483
Project: AWWU PS12 Survey; PS12
Project No.: 7027-01

BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 4362500
Client No.: AWWU-0711-A13

Description / Location: Black Gasket; Level 3
Discharge Pipe 3 Flange At Knife Gate

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	20	Cellulose	80

Accreditations: **NIST-NVLAP No. 101165-0** **NY-DOH No. 11021** **AIHA-LAP, LLC No. 100188**

Analytical Method EPA 600/R-93/116

Comments: (PC) Indicates Stratified Point Count Method performed. Method not performed unless stated. Quantification at <0.25% by volume is possible with this method. (PC–Trace) represents this limit of quantitation. (PC-Trace) means that asbestos was detected but is not quantifiable under the Point Counting regimen. Analysis includes all distinct separable layers in accordance with EPA 600 Method. If not reported or otherwise noted, layer is either not present or the client has specifically requested that it not be analyzed. Small asbestos fibers may be missed by PLM due to resolution limitations of the optical microscope. Therefore, negative PLM results cannot be guaranteed. Electron Microscopy can be used as a confirming technique. Regulatory Limit is based upon the sample matrix.

Analysis Performed By: B. Hargrove

Date: 7/15/2011

EHS ALASKA INCORPORATED

EHS, Alaska, Inc.
11901 Business Blvd., Suite 208, Eagle River, AK 99577
(907) 694-1383 • (907) 694-1382 fax
e-mail • ehsak@ehs-alaska.com

PROJECT NO:	PROJECT NAME:	FACILITY:	COLLECTION DATE:
7027-01	AWWU PS12 Survey	Pump Station 12	07.12.11

CHAIN OF CUSTODY RECORD

ANALYSIS REQUESTED: ☒ PLM BULK ☐ PLM DUST ☐ TEM BULK ☐ LEAD DUST ☐ LEAD TCLP ☐ LEAD PPM ☐ TEM MICROVAC DUST (ASTM 5756)

TYPE:	TURNAROUND:	DISPOSAL:	QUANTITY
☒ ASBESTOS ☐ LEAD	2 DAYS	NORMAL	13

Martin Lindeke
COLLECTED BY (signature)

Martin J. Lindeke
PRINTED NAME

10164.01.17
CERT# / AHERA#

FedEx
SHIPPING METHOD

7972 9968 5720
COURIER (signature)

7-13-11 11:00am
DATE/TIME

RECEIVED
JUL 14 2011
IATL By

SELECTED LABORATORY

SAMPLES ACCEPTED BY

DATE/TIME

ANALYST'S SIGNATURE

DATE
7-15-11

SPECIAL INSTRUCTIONS / COMMENTS:

LAB: RETURN A SIGNED COPY OF THIS FORM WITH THE FINAL REPORT TO EHS-ALASKA, INC.

See sample location drawing for more detailed explanation of exact locations.

OR 7/14/11

FIELD SURVEY DATA

EHS SAMPLE NO. / LAB ID NO	SAMPLE DESCRIPTION, (COLOR, MATERIAL TYPE, LAYERS, FRIABILITY)	LOCATION/COMMENTS (INCLUDING PHOTO/XREF)	RESULTS FOR EHS-ALASKA USE ONLY
AWWU-0711-A01 4362488	Gasket, red, rubber	Level 2, knife gate flange on valve 2	None Detected
AWWU-0711-A02 4362489	Gasket, grey	Level 2, flange on discharge pipe 1at knife gate	None Detected
AWWU-0711-A03 4362490	Gasket, black	Level 3, flange on discharge pipe 4 at knife gate	None Detected
AWWU-0711-A04 4362491	Gasket, black	Level 3 on discharge pipe 1	None Detected
AWWU-0711-A05 4362492	Gasket, green board	Level 4 on discharge 4 at knife gate	None Detected
AWWU-0711-A06 4362493	Gasket , black	Level 4 at ball valve on discharge pipe 1	None Detected
AWWU-0711-A07 4362494	Gasket, green	Level 4 at pipe 1 flange at knife gate	None Detected
AWWU-0711-A08 4362495	Gasket, black	Level 4 at pipe 1 flange joining ball valve	None Detected
AWWU-0711-A09 4362496	Gasket, black	Level 4 at pipe 1 ball valve	None Detected

EHS ALASKA INCORPORATED

EHS-Alaska, Inc.
11901 Business Blvd., Suite 208, Eagle River, AK 99577
(907) 694-1383 • (907) 694-1382 fax
e-mail • ehsak@ehs-alaska.com

PROJECT NO:	PROJECT NAME:	FACILITY:	COLLECTION DATE:
7027-01	AWWU PS12 Survey	Pump Station 12	07.12.11

FIELD SURVEY DATA

EHS SAMPLE NO. / LAB ID NO	SAMPLE DESCRIPTION, (COLOR, MATERIAL TYPE, LAYERS. FRIABILITY)	LOCATION/COMMENTS (INCLUDING PHOTO/XREF)	RESULTS FOR EHS-ALASKA USE ONLY
AWWU-0711-A10 4362497	Gasket, red, rubber	Level 2 at underside of discharge pipe, below knife gate valve 2	None Detected
AWWU-0711-A11 4362498	Paper gasket, white with green backing	Level 4, pump motor 4	None Detected
AWWU-0711-A12 4362499	Paper gasket, white with green backing	Level 4, pump motor 1	None Detected
AWWU-0711-A13 4362500	Flange gasket, black	Level 3, discharge pipe 3 flange at knife gate	None Detected
End			

APPENDIX B

Lead Analyzer Test Results

LEAD BASED PAINT SCREENING

No.	SITE	INSPECTOR	FLOOR	COMPONENT	SUBSTRATE	CONDITION	COLOR	Duration	Time	Depth Index	Results		
											LBP	mg/cm^2	+/- Error
1	AWWU PS 12	LITTLEJOHN	-	SHUTTER CAL	-	-	-	106.43	7/12/2011 13:07	-	-	4.59	0
2	**AWWU PS 12**	**LITTLEJOHN**	**-**	**CALIBRATION CK**	**-**	**-**	**RED**	**20.58**	**7/12/2011 13:09**	**1.04**	**Positive**	**1**	**0.1**
3	**AWWU PS 12**	**LITTLEJOHN**	**-**	**CALIBRATION CK**	**-**	**-**	**RED**	**20.9**	**7/12/2011 13:10**	**1.04**	**Positive**	**1**	**0.1**
4	**AWWU PS 12**	**LITTLEJOHN**	**-**	**CALIBRATION CK**	**-**	**-**	**RED**	**20.63**	**7/12/2011 13:11**	**1.1**	**Positive**	**1.1**	**0.1**
5	AWWU PS 12	LITTLEJOHN	SECOND	VALVE	METAL	INTACT	RED	20.92	7/12/2011 13:18	1.03	Negative	0.9	0.1
6	AWWU PS 12	LITTLEJOHN	SECOND	FLANGE	METAL	INTACT	WHITE	21.43	7/12/2011 13:20	1	Negative	0	0.02
7	AWWU PS 12	LITTLEJOHN	SECOND	FLANGE	METAL	INTACT	GRAY	21.18	7/12/2011 13:21	1.19	Negative	0.01	0.02
8	AWWU PS 12	LITTLEJOHN	SECOND	FLANGE	METAL	INTACT	BLUE	20.66	7/12/2011 13:22	3.65	Negative	0.01	0.02
9	AWWU PS 12	LITTLEJOHN	SECOND	WALL	CONCRETE	INTACT	YELLOW	21.18	7/12/2011 13:23	1	Negative	0	0.02
10	AWWU PS 12	LITTLEJOHN	SECOND	PIPE	METAL	INTACT	GRAY	20.57	7/12/2011 13:25	2.26	Negative	0.01	0.02
11	AWWU PS 12	LITTLEJOHN	VOID	VOID	VOID	VOID	VOID	VOID	7/12/2011 13:32	VOID	VOID	VOID	VOID
12	**AWWU PS 12**	**LITTLEJOHN**	**THIRD**	**VALVE**	**METAL**	**INTACT**	**RED**	**20.27**	**7/12/2011 13:33**	**1.11**	**Positive**	**1.4**	**0.1**
13	AWWU PS 12	LITTLEJOHN	THIRD	CAGE	METAL	INTACT	YELLOW	23.7	7/12/2011 13:35	1.03	Negative	0.9	0.1
14	AWWU PS 12	LITTLEJOHN	THIRD	PIPE	METAL	INTACT	GRAY	12.8	7/12/2011 13:36	2.34	Negative	0.13	0.04
15	AWWU PS 12	LITTLEJOHN	THIRD	WALL	CONCRETE	INTACT	YELLOW	20.58	7/12/2011 13:40	1	Negative	0	0.02
16	AWWU PS 12	LITTLEJOHN	FOURTH	ACTATOR	METAL	INTACT	RED	22.15	7/12/2011 13:43	1.04	Negative	0.7	0.1
17	AWWU PS 12	LITTLEJOHN	FOURTH	VALVE	METAL	INTACT	RED	9.63	7/12/2011 13:44	1	Negative	0.29	0.04
18	AWWU PS 12	LITTLEJOHN	FOURTH	VALVE	METAL	INTACT	RED	20.64	7/12/2011 13:46	1	Negative	0.4	0.1
19	AWWU PS 12	LITTLEJOHN	FOURTH	PUMP	METAL	INTACT	GRAY	20.56	7/12/2011 13:53	3.32	Negative	0.11	0.04
20	AWWU PS 12	LITTLEJOHN	VOID	VOID	VOID	VOID	VOID	VOID	7/12/2011 13:54	VOID	VOID	VOID	VOID
21	AWWU PS 12	LITTLEJOHN	FOURTH	BEARING BOX	METAL	INTACT	BLUE	20.57	7/12/2011 13:55	2.01	Negative	0.04	0.02
22	**AWWU PS 12**	**LITTLEJOHN**	**FOURTH**	**PIPE**	**METAL**	**PEELING**	**GRAY**	**20.31**	**7/12/2011 13:56**	**5.35**	**Positive**	**4.5**	**0.4**
23	AWWU PS 12	LITTLEJOHN	VOID	VOID	VOID	VOID	VOID	VOID	7/12/2011 13:57	VOID	VOID	VOID	VOID
24	AWWU PS 12	LITTLEJOHN	FOURTH	PIPE	METAL	PEELING	GRAY	20.57	7/12/2011 13:59	1.64	Negative	0.05	0.02
25	**AWWU PS 12**	**LITTLEJOHN**	**FOURTH**	**PIPE**	**METAL**	**PEELING**	**GRAY**	**20.87**	**7/12/2011 14:00**	**5.18**	**Positive**	**3.6**	**0.3**
26	AWWU PS 12	LITTLEJOHN	FOURTH	PIPE	METAL	PEELING	GRAY	20.27	7/12/2011 14:01	1.33	Negative	0	0.02
27	**AWWU PS 12**	**LITTLEJOHN**	**FOURTH**	**PIPE**	**METAL**	**PEELING**	**GRAY**	**20.55**	**7/12/2011 14:02**	**3.12**	**Positive**	**1.7**	**0.2**
28	AWWU PS 12	LITTLEJOHN	VOID	VOID	VOID	VOID	VOID	VOID	7/12/2011 14:05	10	VOID	VOID	VOID
29	AWWU PS 12	LITTLEJOHN	FOURTH	FLOOR	METAL	PEELING	GRAY	20.32	7/12/2011 14:06	10	Negative	0.5	0.4
30	AWWU PS 12	LITTLEJOHN	FOURTH	WALL	CONCRETE	INTACT	YELLOW	20.29	7/12/2011 14:07	1.39	Negative	0	0.02
31	AWWU PS 12	LITTLEJOHN	FOURTH	WALL	CONCRETE	INTACT	YELLOW	20.29	7/12/2011 14:08	1	Negative	0	0.02
32	AWWU PS 12	LITTLEJOHN	VOID	VOID	VOID	VOID	VOID	VOID	7/12/2011 14:10	VOID	VOID	VOID	VOID
33	**AWWU PS 12**	**LITTLEJOHN**	**FOURTH**	**VALVE**	**METAL**	**INTACT**	**RED**	**20.65**	**7/12/2011 14:11**	**1.78**	**Positive**	**9**	**0.6**
34	AWWU PS 12	LITTLEJOHN	FOURTH	PIPE	METAL	INTACT	GRAY	20.58	7/12/2011 14:16	1.03	Negative	0.01	0.02
35	**AWWU PS 12**	**LITTLEJOHN**	**FOURTH**	**PAD**	**CONCRETE**	**INTACT**	**YELLOW**	**20.88**	**7/12/2011 14:20**	**1**	**Positive**	**7.7**	**0.6**
36	AWWU PS 12	LITTLEJOHN	FOURTH	PAD	CONCRETE	INTACT	YELLOW	20.27	7/12/2011 14:21	1	Negative	0	0.02
37	**AWWU PS 12**	**LITTLEJOHN**	**THIRD**	**PIPE**	**METAL**	**INTACT**	**GRAY**	**20.27**	**7/12/2011 14:27**	**3.44**	**Positive**	**2.6**	**0.2**
38	AWWU PS 12	LITTLEJOHN	THIRD	PIPE	METAL	INTACT	GRAY	25.62	7/12/2011 14:29	3.18	Negative	0.9	0.1
39	AWWU PS 12	LITTLEJOHN	THIRD	CEILING	CONCRETE	INTACT	YELLOW	20.26	7/12/2011 14:30	1	Negative	0	0.02
40	**AWWU PS 12**	**LITTLEJOHN**	**SECOND**	**PIPE**	**METAL**	**INTACT**	**GRAY**	**26.1**	**7/12/2011 14:33**	**3.2**	**Positive**	**1.1**	**0.1**

LEAD BASED PAINT SCREENING

No.	SITE	INSPECTOR	FLOOR	COMPONENT	SUBSTRATE	CONDITION	COLOR	Duration	Time	Depth Index	Results		
											LBP	mg/cm^2	+/- Error
41	AWWU PS 12	LITTLEJOHN	SECOND	PIPE	METAL	INTACT	GRAY	20.57	7/12/2011 14:34	1.76	Negative	0.01	0.02
42	**AWWU PS 12**	**LITTLEJOHN**	**FIRST**	**STRIP**	**CONCRETE**	**INTACT**	**YELLOW**	**20.63**	**7/12/2011 14:38**	**1.29**	**Positive**	**4.2**	**0.2**
43	**AWWU PS 12**	**LITTLEJOHN**	**-**	**CALIBRATION CK**	**-**	**INTACT**	**RED**	**20.55**	**7/12/2011 14:40**	**1.03**	**Positive**	**1**	**0.1**
44	**AWWU PS 12**	**LITTLEJOHN**	**-**	**CALIBRATION CK**	**-**	**INTACT**	**RED**	**21.19**	**7/12/2011 14:41**	**1.07**	**Positive**	**1**	**0.1**
45	**AWWU PS 12**	**LITTLEJOHN**	**-**	**CALIBRATION CK**	**-**	**INTACT**	**RED**	**20.66**	**7/12/2011 14:42**	**1.05**	**Positive**	**1**	**0.1**

Table Heading Descriptions:

Duration: This is the nominal time in seconds that each sample was analyzed.

Depth Index: Indicates the relative depth of the lead. A Depth Index (DI) of less than 1.5 indicates lead very near the surface layer of paint. A DI between 1.5 and 4.0 indicates moderately covered lead. A DI greater than 4.0 indicates the lead paint is deeply buried beneath multiple layers of paint.

LBP: Results are shown as positive (POS $\geq$ 1.0 mg/cm^2), inconclusive (INC) or negative (NEG < 1.0 mg/cm^2). The results are based on the combined results of the K and L shell readings. L shell and K shell readings are not provided, but are available. Positive results are shown in bold print.

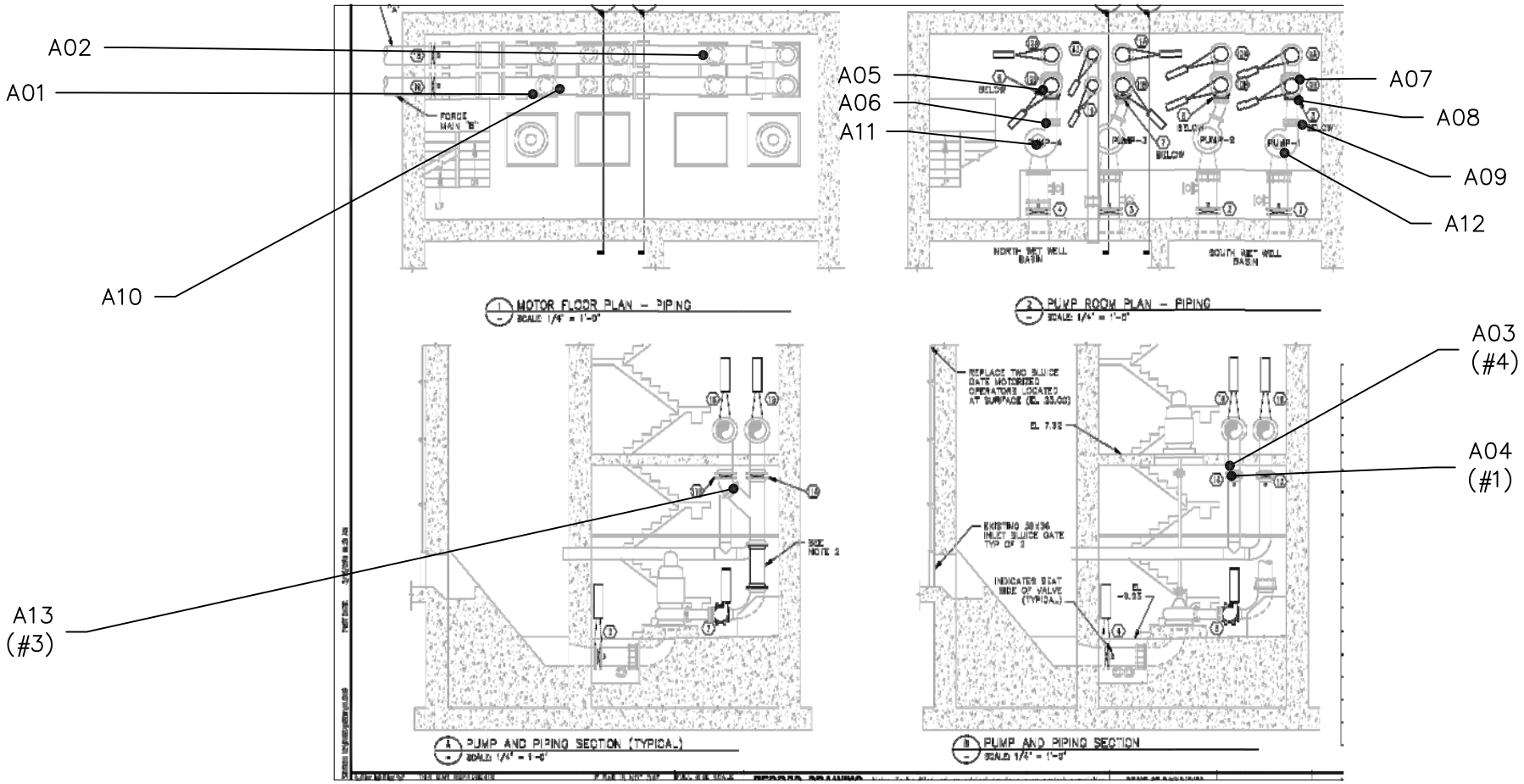
mg/cm^2: This is the testing results produced by the NITON XLi-303 instrument in milligrams of lead per square centimeter (mg/cm^2). The EPA defines lead based paint as paint containing lead at 1.0 mg/cm^2 or greater. A negative number is a result of an internal computation made by the instrument and should be interpreted as zero. Even though paint may be termed negative (less than 1.0 mg/cm^2) by EPA definition, disturbance of the paint may still be regulated by OSHA under 29 CFR 1926.62. Where lead is present at any level, appropriate engineering controls, work practices and personal protective equipment should be used until a negative exposure assessment can be determined. <LOD indicates that the lead present was less than the limits of detection of the instrument (very little or no lead present).

VOID: This indicates that the test was intentionally terminated by the operator due to operator error (e.g. - operator moved analyzer while testing).

Substrate: Where ceramic is shown as a substrate, lead content is typically from the glazing on the tile unless the tile is painted.

APPENDIX C

Drawings of Sample Locations



1 / C-1 PUMP STATION FLOOR PLAN

N

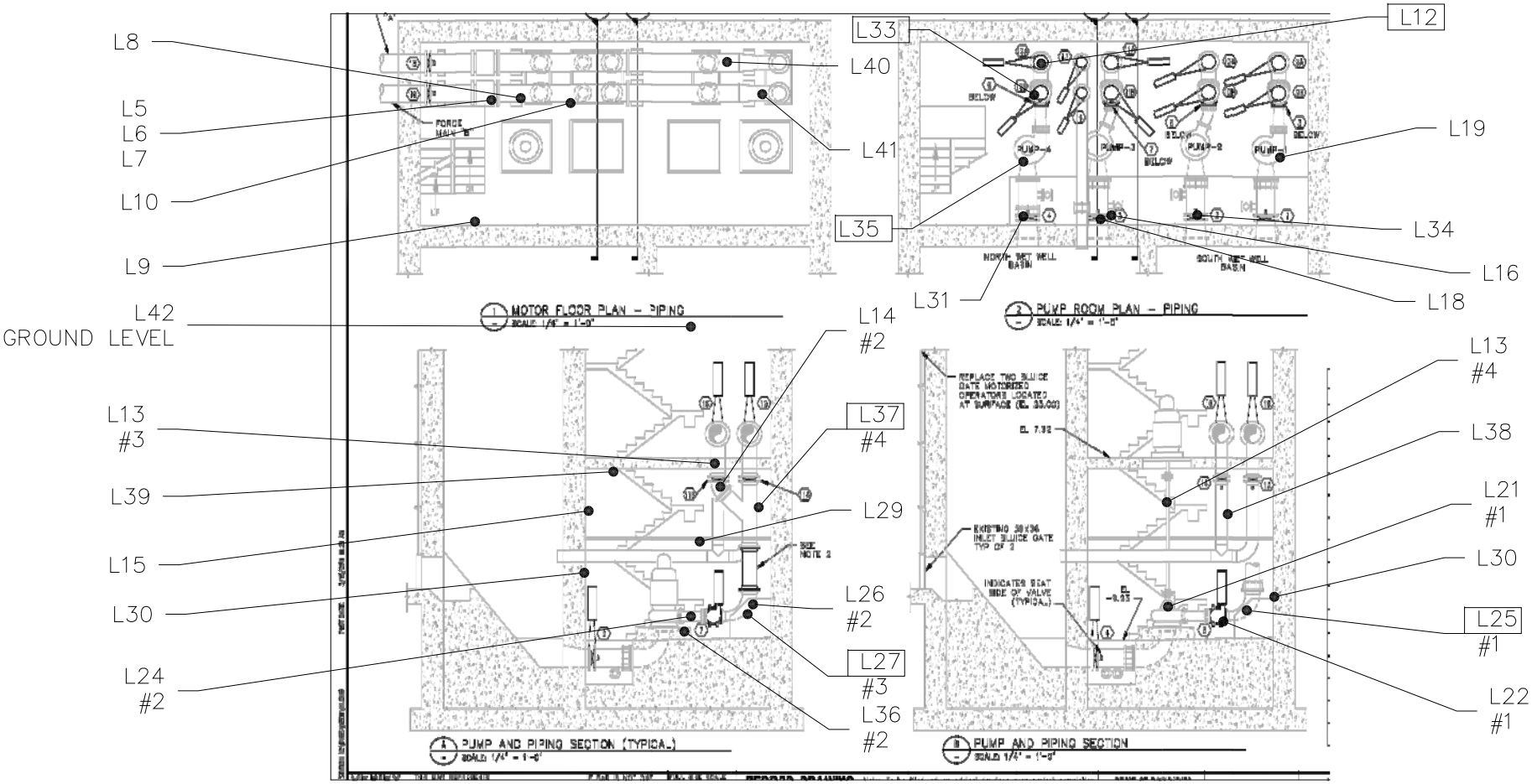
LEGEND

AXX ASBESTOS TEST LOCATION

AXX LAB TEST RESULTS POSITIVE FOR ASBESTOS

REFER TO TESTING SUMMARY IN REPORT FOR FULL DETAILS.
ALL SAMPLES HAVE AWWU-0711- PREFIX.

ANCHORAGE WATER AND WASTEWATER UTILITIES	PUMP STATION 12 ANCHORAGE, ALASKA ASBESTOS SAMPLES	EHS ALASKA INCORPORATED ENGINEERING, HEALTH & SAFETY CONSULTANTS	DRAWN: SEL CHECK: RAF / DATE: 07-19-11 / FILE #: 7027-SL / DWG.NO: C-1



1 / C-2 PUMP STATION FLOOR PLAN

N

LEGEND

- LXX — LEAD TEST LOCATION
- [LXX] — LEAD TEST CLASSIFIED AS LEAD-BASED PAINT

REFER TO TESTING SUMMARY IN REPORT FOR FULL DETAILS.

ANCHORAGE WATER AND WASTEWATER UTILITIES	PUMP STATION 12 ANCHORAGE, ALASKA LEAD SAMPLES	EHS ALASKA INCORPORATED ENGINEERING, HEALTH & SAFETY CONSULTANTS	DRAWN: SEL CHECK: RAF / DATE: 07-19-11 / FILE #: 7027-SL / DWG.NO: C-2

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 SEWER IMPROVEMENTS

PUMP STATION 12 FORCE MAIN / INTERCEPTOR C GRAVITY JUNCTION REHABILITATION

SECTION XIX

MAXIMO ASSET REPORTS

Equipment Organization and Classification Guide

Asset and Location Attributes Report

Anchorage Water & Wastewater Utility

Operations & Maintenance Division

Maximo 7.6 Business Standards:
ASSETS & LOCATIONS

Project Name:	Maximo 7.6 MVP Upgrade
Project Code:	
Project Sponsor:	Mark Corsentino
Author:	Steven Golab
	Tammy Short
Status:	FINAL
Version:	2.1
Date:	02/04/2020

Document History shows the changes made to this document over time.

DOCUMENT HISTORY			
Author	**Description of Changes**	**Date**	**Version**
Aubrey Campbell	First Draft; preliminary content	08/30/17	1.0
Aubrey Campbell	Initial content revision	08/31/17	1.1
Aubrey Campbell	Additional content revisions	09/11/17	1.2
Aubrey Campbell	New content for reporting asset downtime for hydrants and for approving the decommissioning of a fleet assets	10/09/17	1.3
Aubrey Campbell	Revisions to Reporting Asset Downtime for Hydrants.	10/12/17	1.4
Steven Golab	Revisions per Steering Committee	12/04/17	1.5
Steven Golab &Tammy Short	Revisions to Assets from Capital Projects and Fleet Assets	08/15/18	2.0
Steven Golab &Tammy Short	Revisions per Maximo Asset Group.	08/22/19	2.1

The individuals listed below contributed to the development of this document.

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Subject-Matter Expert	Tammy Short	Reviews & Information

Each individual listed below has reviewed this document and verified that it is complete and accurate.

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Subject-Matter Expert	Tammy Short	08/30/17
Subject-Matter Expert	Steven Golab	08/31/17
Subject-Matter Expert	Tammy Short	08/31/17
Subject-Matter Expert	Steven Golab	09/10/17

By signing below, all Approvers verify that the information in this document is complete, accurate, and actionable.

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1. Naming and Hierarchy

1.1. Discussion & Example

Maximo 7.6 uses "smart-naming" for assigning numbers to Locations. These smart-names are based on the location's position within the Locations & Assets Hierarchy (also known as the Drilldown Hierarchy).

Hierarchy Level	Location	Location Name
Level 1	Wastewater	WASTEWATER
↳ Level 2	↳ Asplund Plant	AWWTF
↳ Level 3	↳ Processes	AWWTFPRC
↳ Level 4	↳ Clarification Process	AWWTFPRCCLP
↳ Level 5	↳ Primary Clarifier #1	AWWTFPRCCLPCLF1

Assets are auto-numbered; assets are also part of the Locations & Assets Hierarchy.

1.2. Smart-Naming Reference Sheet

The Smart-Naming Reference Sheet is available on the AWWU Intranet, Maximo Resources Library:
http://awwusp.awwu.biz/sites/OandM/SitePages/Maximo%20Resources%20Library.aspx
Also the Location Template Reference Guide is located in Appendix 9.2.

1.3. Maximo Hierarchy Dropdown

You can access the Drilldown Hierarchy inside Maximo 7.6 to find a particular location, facility, process, system, or asset. For instructions on how to access and use the Hierarchy Drilldown, refer to Section 1.1 in the *Create and Use Work Orders* User Guide in the Maximo Resources Library.

1.4. Numbering Fleet Assets

Maximo 7.6 does not auto-number new fleet assets; instead, new fleet assets are numbered by their assigned AWWU Vehicle Number, and start with an "F".

2. Creating Assets from Capital Projects

2.1. Design Phase

1. Engineering requests from the Asset Manager (O&M) a Hierarchy for the project location and current Maximo asset criteria.

2. *When the capital project design phase reaches 95% completion:* Engineering submits to the Asset Manager (O&M) a list of assets to be removed or installed.
3. *The Asset Managers will schedule a meeting with Engineering, Plant and O&M superintendents to verify the list of assets.*

4. Asset Manager creates the new asset(s) in Maximo; Asset is in *Not Ready* status in Maximo, which disallows charges against the Asset. Existing assets to be removed remain in service until a copy of the Use and Useful form is received from Engineering.

5. *The Asset Managers will generate the Maximo A61 Report (See Appendix 9.1) which will list all of the assets inputted in Maximo and the associated attributes needed which is sent to Project Manager at 100% design.*

2.2. Construction Phase

1. Engineering notifies the Asset Manager of construction starting; Asset goes to Not Accepted status; this allows costs to be charged against the Asset. The asset to be removed will be moved to Pending Decommission.

2. When the assets are Used and Useful: Engineering will deliver the Maximo A61 Report with the asset specifications to Asset Manager and will notify them of any changes to the asset list.
3. Then the Asset Manager adds the asset specifications to Maximo and puts the assets in operating status.

3. Asset Activities

AWWU uses five Asset Activities in Maximo 7.6 for vertical assets. Most work order types do not require an asset activity; three work order types (CM, IMP, and SAFE) require an Asset Activity before the Work QA Reviewer can update the work order to Complete (COMP) or No Work Complete (NOWRKCMP).

Required Asset Activity	Maximo action (vertical assets only)
Replace	Set the existing asset on WO to *Pending Decommission* status. Create a new asset in *Not Ready* status at the Location on the work order.
Repair	No Action.
Install	Create a new asset in *Not Ready* status at the Location on the work order.
Remove	Set the existing asset on the work order to *Pending Decommission* status.
Betterment	No Action.

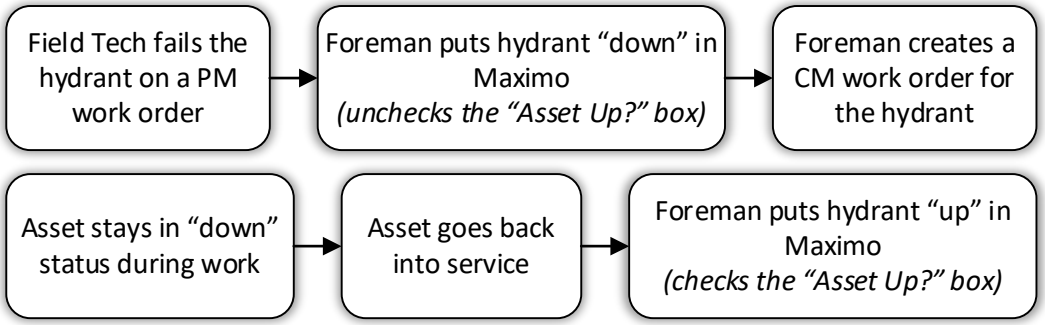
4. Asset Statuses

Asset Status	Description and Details	Asset Manager Tasks
Not Ready	The starting status for all new assets. Users cannot charge costs to an asset in *Not Ready*.	Creates the asset in *Not Ready* when a capital project design phase reaches 95% completion. Maximo creates an asset in *Not Ready* when the work order has either *Replace* or *Install* as an Asset Activity.
Not Accepted	An interim status to charge costs to the asset before it has been fully commissioned into service. Users can charge costs to an asset in *Not Accepted*.	Updates the asset to *Not Accepted* when the construction phase of a capital project starts.
Operating	The asset stays in *Operating* during its useful life, and receives maintenance, repairs, and improvements.	Updates the asset to *Operating* when the asset becomes “used and useful”.
Pending Decommission	An interim status for an asset that will be retired, removed, or replaced. Users can charge costs to an asset in *Pending Decommission*.	Updates the asset to *Pending Decommission* when notified for a capital project.

Asset Status	Description and Details	Asset Manager Tasks
		Maximo updates an asset to *Pending Decommission* when the work order has either *Replace* or *Remove* as an Asset Activity.
Decommissioned	An asset's final status after it has been retired, removed, or replaced. Users cannot charge costs to an asset in *Decommissioned*.	Updates the asset to *Decommissioned* when notified by field staff or for a capital project. The date must be consistent with the Use and Useful date.
Pending Invalid Asset	The Maximo-GIS interface uses *Pending Invalid Asset* to identify a horizontal asset that should not be in the GIS. Users cannot select this status and cannot charge costs to an asset in *Pending Invalid Asset*.	No Action. Maximo Planner must verify this status with the GIS work group.
Pending Retirement	Equivalent to *Pending Decommission*, the Maximo-GIS Interface uses *Pending Retirement* when preparing to take an asset out of service. Users can still charge costs to assets in *Pending Retirement,* but cannot change certain asset attributes through the Maximo-GIS Interface.	No Action. Maximo Planner must verify this status with the GIS work group.

5. Reporting Asset Downtime for Hydrants

Maximo 7.6 uses the Report Downtime feature to show whether an asset is out of service.



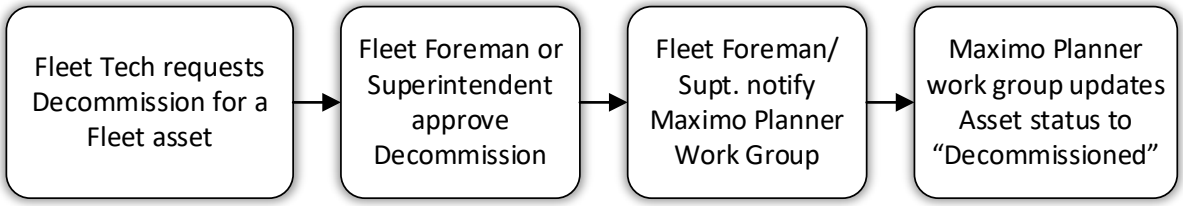
6. Fleet Assets

6.1. Creating Fleet Assets

1. Fleet Foreman sets up meeting with vendor and Maximo Work Management Team (MWMT). During the meeting, the Foreman can sign all appropriate purchasing documents for vendor, work with the MWMT to determine Maximo Asset number for new vehicles, and then document that new asset number on the registration form and vehicle specification sheet.
2. MWMT creates asset in Maximo and applies meters. Scans all documents, saving to Fleet purchase folder and to the asset record.
3. MWMT then gives all documents to Fleet Superintendent to create new vehicle(s) in FM Live (Fuel Master System) and creates set up work orders to Pre-Approval Status.
4. The Superintendent gives all documents to Expediter for process of payment.

5. Expediter creates Good Receipts on original Shopping Cart in SAP for vehicles on invoice only. Original documents are kept for a limited time by Expediter. Give vehicle specification sheet to Fleet Foreman.
6. MWMT processes work order to Approved status.
7. Fleet Technician completes set up and completes the Fleet Specifications form and gives it to MWMT so vehicle asset record is fully filled out in Maximo.
8. MWMT changes vehicle Asset status to "Operating" applies meters and creates PMA record for servicing.
9. Fleet Foreman notifies Fleet Superintendent once new vehicle is ready to be put into service.

6.2. Decommissioning Fleet Assets



7. Asset Security Groups

7.1. Asset Manager

Users who are responsible for reviewing and reconciling asset replacements are assigned to the Asset Manager Security group. Asset Managers can

- Create and modify assets
- Update asset status
- Update asset specifications
- Move Locations and Assets within the Drilldown Hierarchy
- Perform other actions that affect Assets and Locations

7.2. Fleet Tech

Users who work with Fleet assets are assigned to the Fleet Tech security group. Fleet Techs can

- Enter meter information like vehicle mileage
- Update asset meters
- Update asset specifications
- Change the labor or work group assigned to the vehicle.

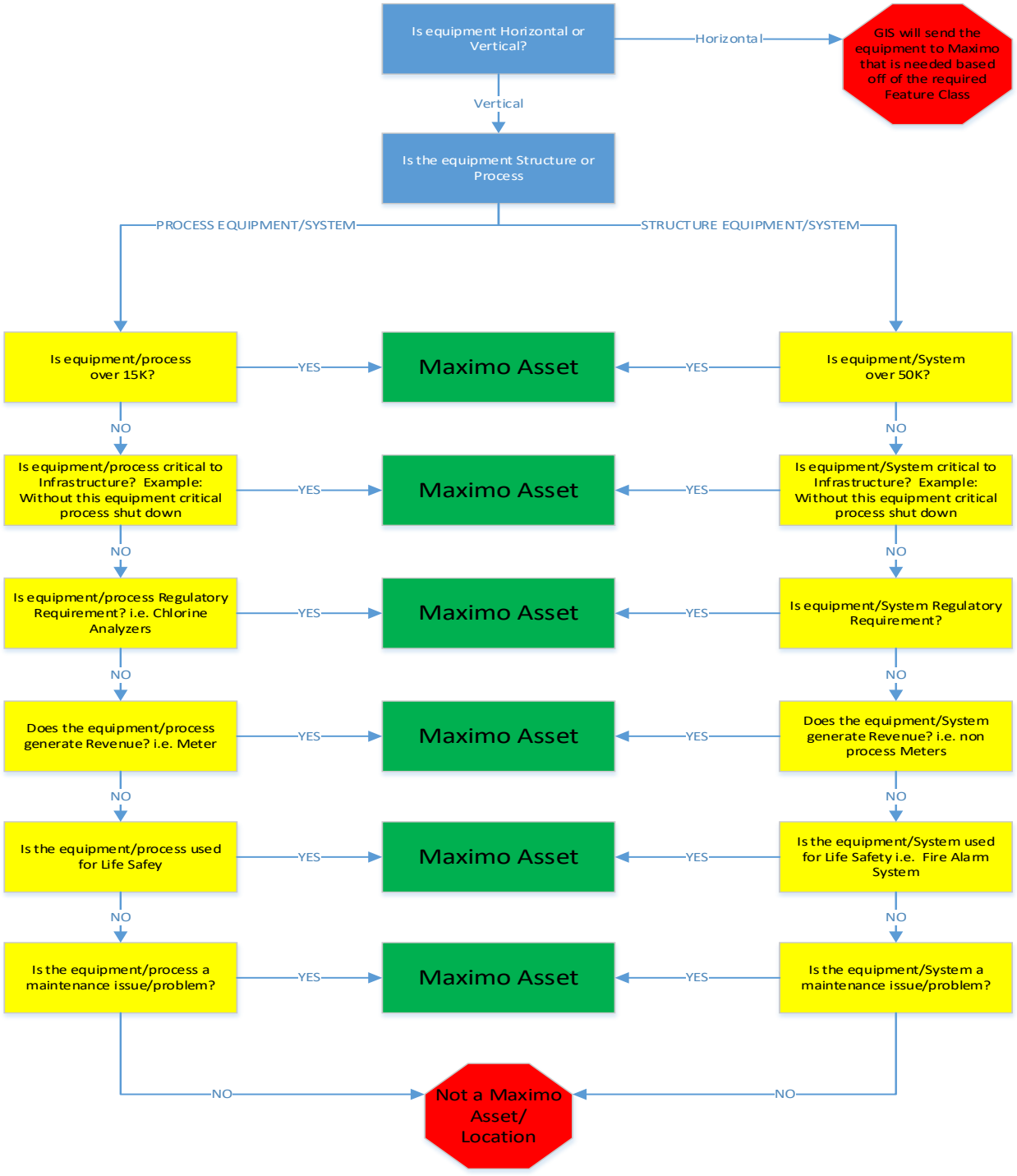
8. Assets and Retirement Units

Retirement Units are depreciable assets: AWWU can recover the cost to install, maintain, repair, and remove the retirement unit. Maximo uses two asset types to show if a location or asset is a retirement unit, or *part* of a retirement unit: RETIREUNIT and PARTRU. If you are working and determine that you need to replace a vertical asset that is a retirement unit, contact your superintendent.

8.1. Maximo Assets

Any equipment that is horizontal or vertical that meets the Maximo Asset Determination Flow Chart. These assets may or may not be a retirement unit. They will meet specific guidelines for AWWU's need to track.

8.2. Maximo Asset Determination Flow Chart



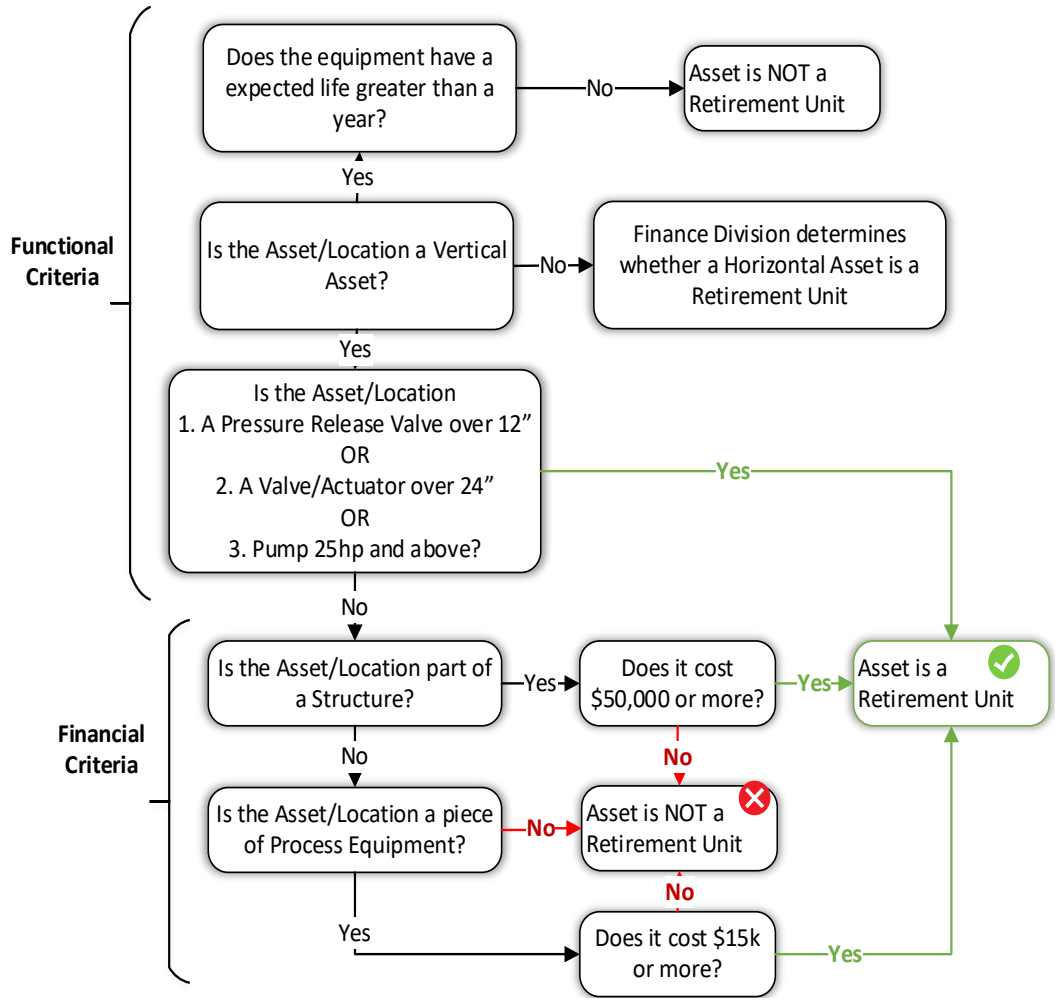
8.3. Example of Retirement Units Tracked in Maximo

Vertical Assets	Horizontal Assets
• Pressure Release Valves over 12” • Valve/Actuators over 24” • Pumps 25hp and above • Generators • Backflow Preventers • Fleet Assets • Structure Assets over $50,000 • Process Equipment over $15,000	• Hydrants • Manholes • Pipes • Services • Keyboxes • Other GIS assets

If you encounter either a vertical or horizontal asset that you think belongs in Maximo 7.6, contact the Maximo Planner work group for follow-up.

8.4. Retirement Unit General Guidance Criteria

Assets must meet certain functional or financial criteria to qualify as retirement units: Finance has the final decision when determine if an asset is a retirement unit.



8.5. Policy and Procedures for Capitalization

http://awwusp.awwu.biz/sites/AS/PolicyAndProcedures/PP030-01_IdentificationandAccountingCapitalExpenditures.pdf

Appendixes

9.1. Example A61 Report

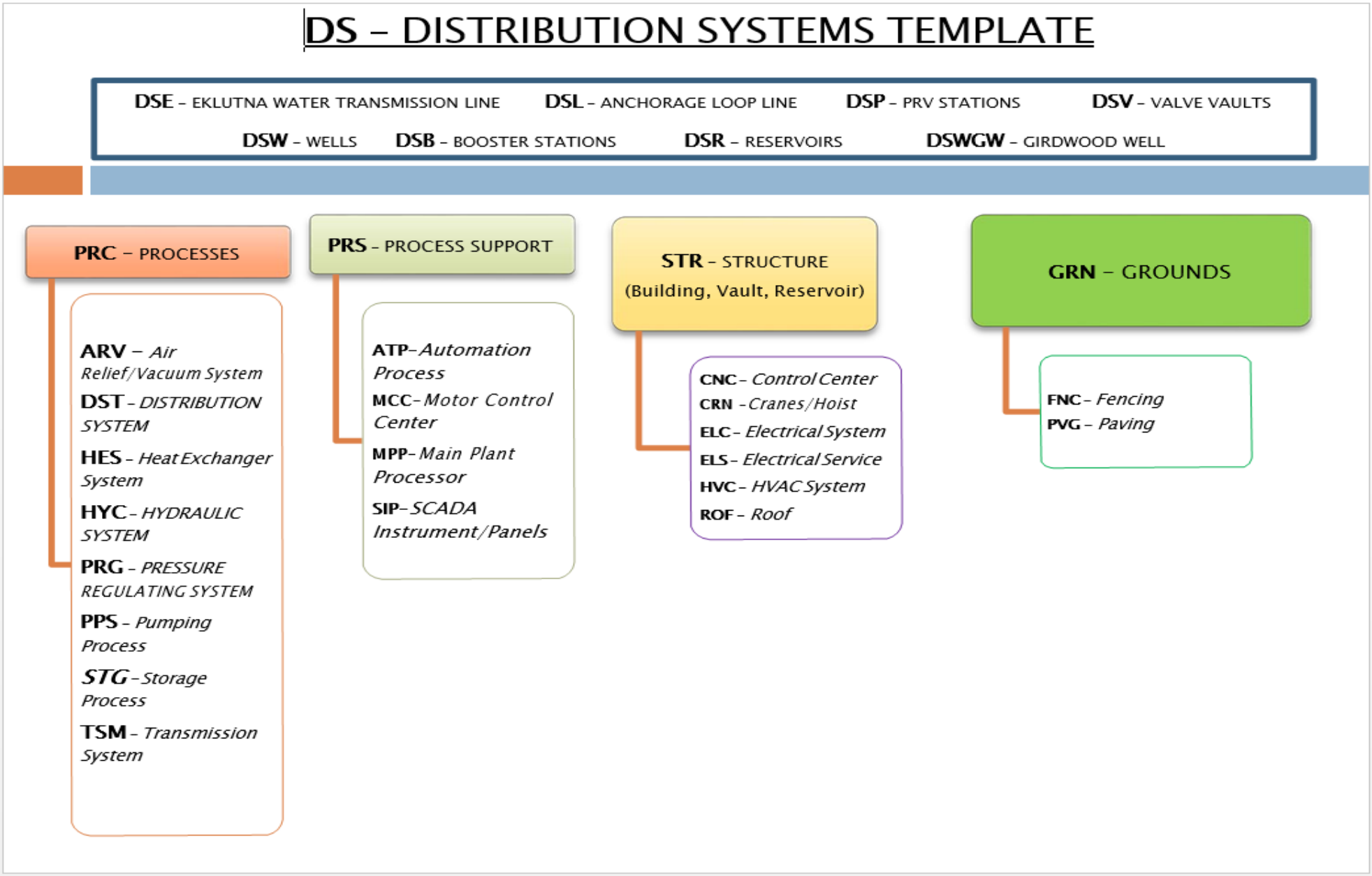
Asset Attrtibute Spec Report (A61)

Asset Details			
Asset	314313 BOILER # 2	Location	ARSTRMNBHVC HVAC SYSTEM
Classification	BOILER	Failure Class	BOILER
Asset Tag	B-2	Installation Date	
Model	FTX725	Installfinancprojid	WW.H8004
Serial #		Purchase Price	0.00
Vendor		Contractor Warranty Exp Date	
Manufacturer	Lochinvar	Warranty Expiration Date	

Specifications

Attribute	Description	Value	Unit of Measure	Changed By	Changed Date
BURNER HP	BURNER HP	1.50		62909	6/11/19
BURNER POWER	BURNER POWER (Volts/PH)	120/1		62909	6/11/19
FUEL TYPE	Type of Fuel	Natural Gas		62909	6/11/19
GROSS INPUT	Gross Input (MBH)	725.00		62909	6/11/19
GROSS OUTPUT	GROSS OUTPUT (MBH)	705.00		62909	6/11/19

9.2. Location Templates



CS – COLLECTION SYSTEMS TEMPLATE

CSP – Pump Stations (ie., **CSP059** PUMP STATION #59 – P059; **CSP041** PUMP STATION #41 – P041)

CSM – Meter Stations (i.e., **CSM01** BLUFF ROAD METER STATION 1)

CSS – Septage Stations(CSSKNG – King Street; CSSTPN – Turpin)

PRC – PROCESSES

- **MTS** – *Metering System*
- **PPP** – *Pumping*

PRS – PROCESS SUPPORT

- *Process*
- **MCC** – *Motor Control Center*
- **MPP** – *Main Plant Processor*
- **SIP** – *SCADA Instrument/Panels*

STR – STRUCTURE

- **STRMNB** – *Main Bldg*
- **STRDYP** – *Dry Pit*
- **STRGNB** – *Generator Bldg*
- **STROWW** – *Overflow Wet Well*
- **STRWWL** – *Wet Well*
- **STRCNC** – *Control Center*
- **STRGTC** – *Grit Chamber*
- **STRVAL** – *Valve Vault*
  - **ELC** – *Electrical System*
  - **HVC** – *HVAC System*
  - **ROF** – *Roof*

GRN – GROUNDS

- **FNC** – *Fencing*
- **PVG** – *Paving*

WASTEWATER FACILITY TEMPLATE

Asplund – **AWWTF** Eagle River – **ERWWTF** Girdwood – **GWWTF** Operations&Maint – **OM**

PRC – PROCESSES

AEP – *Aeration Process*
CLP – *Clarification*
DIS – *Disinfection*
EFF – *Effluent*
HWK – *Headworks*
IFP – *Influent Pumping*
INC – *Incineration*
OCP – *Odor Control*
PDP – *Plant Drain*
PGR – *Primary Grit Removal*
PII – *Plant Influent Isolation*
PMS – *Primary System*
SCE – *Scum Ejector*
SCM – *Scum*
SCR – *Screening*
SEC – *Secondary Process*
SHP – *Solids Handling*
SPS – *Sampling Sys INF/EFF*
SGP – *Surge Lagoon*
TER – *Teritiary*
W2P – *W2 Process*
W3P – *W3 Process*

PRS – PROCESS SUPPORT

ATP – *Automation*
CHP – *Chemical*
LAB – *Lab*
MCC – *Motor Control Center*
SIP – *SCADA Instrument/Panels*

STR – STRUCTURE

CTV – CCTV System
CNC – *Control Center*
EFS – *Effluent Str*
ELS – *Electrical Service*
PAS – *PA System*
SCS – *Security System*
WMS – *Warm Storage*
UTD – *Utilidor*

GRN – GROUNDS

EXL – *Exterior Lighting*
FNC – *Fencing*
LDS – *Landscaping*
PVG – *Paving*

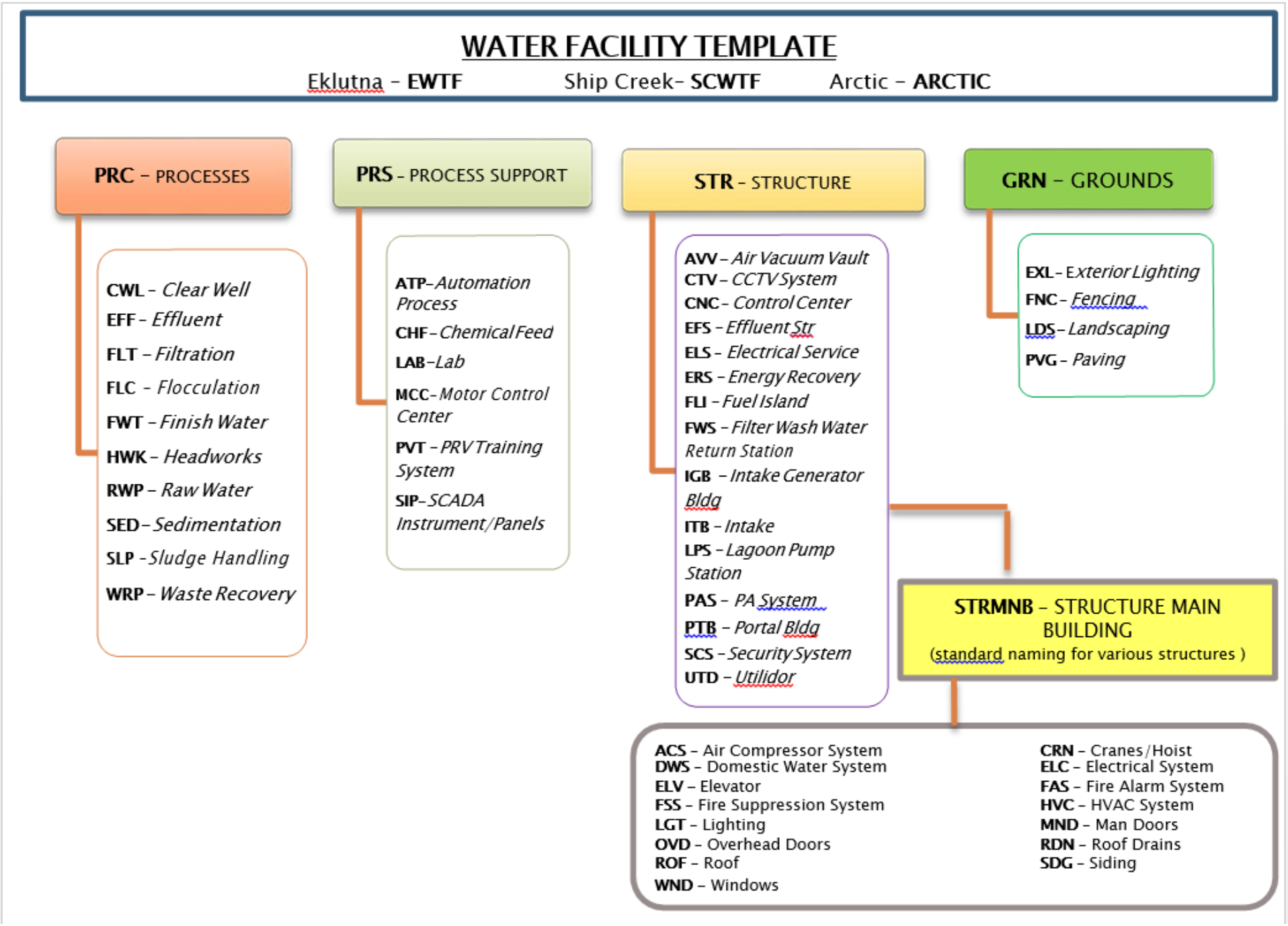
STRMNB – STRUCTURE MAIN BUILDING

(standard naming for various structures)

ACS – Air Compressor System
DWS – Domestic Water System
ELV – Elevator
FSS – Fire Suppression System
LGT – Lighting
OVD – Overhead Doors
ROF – Roof
WND – Windows
CRN – Cranes/Hoist
ELC – Electrical System
FAS – Fire Alarm System
HVC – HVAC System
MND – Man Doors
RDN – Roof Drains
SDG – Siding

WATER FACILITY TEMPLATE

Eklutna – **EWTF** Ship Creek– **SCWTF** Arctic – **ARCTIC**



Asset Attribute Spec Report (A61)

Asset Details			
Asset	337423 SEWAGE PUMP MOTOR #1	Location	CSP012PPP PUMPING PROCESS
Classification	MOTOR	Failure Class	MOTOR
Asset Tag		Installation Date	
Model		Instalfinancprojid	WW.H7713
Serial #		Purchase Price	0.00
Vendor		Contractor Warranty Exp Date	
Manufacturer		Warranty Expiration Date	

Asset Attribute Spec Report (A61)

Asset Details			
Asset	337424 SEWAGE PUMP MOTOR #2	Location	CSP012PPP PUMPING PROCESS
Classification	MOTOR	Failure Class	MOTOR
Asset Tag		Installation Date	
Model		Instalfinancprojid	WW.H7713
Serial #		Purchase Price	0.00
Vendor		Contractor Warranty Exp Date	
Manufacturer		Warranty Expiration Date	

Asset Attribute Spec Report (A61)

Asset Details			
Asset	337425 SEWAGE PUMP MOTOR #3	Location	CSP012PPP PUMPING PROCESS
Classification	MOTOR	Failure Class	MOTOR
Asset Tag		Installation Date	
Model		Instalfinancprojid	WW.H7713
Serial #		Purchase Price	0.00
Vendor		Contractor Warranty Exp Date	
Manufacturer		Warranty Expiration Date	

Asset Attribute Spec Report (A61)

Asset Details			
Asset	337426 SEWAGE PUMP MOTOR #4	Location	CSP012PPP PUMPING PROCESS
Classification	MOTOR	Failure Class	MOTOR
Asset Tag		Installation Date	
Model		Instalfinancprojid	WW.H7713
Serial #		Purchase Price	0.00
Vendor		Contractor Warranty Exp Date	
Manufacturer		Warranty Expiration Date	

Asset Attribute Spec Report (A61)

Asset Details			
Asset	337427 SEWAGE PUMP #1	Location	CSP012PPP PUMPING PROCESS
Classification	PUMP	Failure Class	
Asset Tag		Installation Date	
Model		Instalfinancprojid	WW.H7713
Serial #		Purchase Price	0.00
Vendor		Contractor Warranty Exp Date	
Manufacturer		Warranty Expiration Date	

Asset Attribute Spec Report (A61)

Asset Details			
Asset	337428 SEWAGE PUMP #2	Location	CSP012PPP PUMPING PROCESS
Classification	PUMP	Failure Class	
Asset Tag		Installation Date	
Model		Instalfinancprojid	WW.H7713
Serial #		Purchase Price	0.00
Vendor		Contractor Warranty Exp Date	
Manufacturer		Warranty Expiration Date	

Asset Attribute Spec Report (A61)

Asset Details			
Asset	337429 SEWAGE PUMP #3	Location	CSP012PPP PUMPING PROCESS
Classification	PUMP	Failure Class	
Asset Tag		Installation Date	
Model		Instalfinancprojid	WW.H7713
Serial #		Purchase Price	0.00
Vendor		Contractor Warranty Exp Date	
Manufacturer		Warranty Expiration Date	

Asset Attribute Spec Report (A61)

Asset Details			
Asset	337430 SEWAGE PUMP #4	Location	CSP012PPP PUMPING PROCESS
Classification	PUMP	Failure Class	
Asset Tag		Installation Date	
Model		Instalfinancprojid	WW.H7713
Serial #		Purchase Price	0.00
Vendor		Contractor Warranty Exp Date	
Manufacturer		Warranty Expiration Date	

Municipality of Anchorage

Anchorage Water and Wastewater Utility

2022 SEWER IMPROVEMENTS

PUMP STATION 12 FORCE MAIN / INTERCEPTOR C GRAVITY JUNCTION REHABILITATION

SECTION XX

DRAWINGS (UNDER SEPARATE COVER)