

**CONTRACT DOCUMENTS AND SPECIFICATIONS
FOR CONSTRUCTION OF**

CITY OF UNALASKA

Cells II-1 and II-2 Landfill Expansion Project

DPW PROJECT No. 12802

Prepared for:

City of Unalaska
P.O. Box 610
Unalaska, Alaska 99685
(907) 581-1260

FOR BID V.2

Prepared by:

Bristol Engineering Services Corporation
111 W. 16th Avenue, Third Floor
Anchorage, AK 99501
(907) 563-0013

May 2014

City of Unalaska
CELLS II-1 AND II-2 LANDFILL EXPANSION PROJECT

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Part 1

BIDDING REQUIREMENTS

SECTION 00030 – INVITATION TO BID

Sealed Bids for the City of Unalaska **CELLS II-1 AND II-2 LANDFILL EXPANSION PROJECT**, addressed to the City of Unalaska, will be received at the following location:

City of Unalaska
Office of the City Clerk
P.O. Box 610
43 Raven Way
Unalaska, Alaska 99685
Tel. 907-581-1251
Fax 907-581-1417

OR
Bristol Engineering Services Corporation
111 W. 16th Avenue, Third Floor
Anchorage, Alaska 99501
Tel. 907-563-0013
Fax 907-563-6713

Sealed bids will be received until 2:00 p.m., local time on July 1, 2014 and then will be publicly opened and read. Any bids received after the time and date specified will not be considered.

The work will include, but not be limited to, furnishing all labor, tools, equipment, and materials and performing all operations in connection with the **CELLS II-1 AND II-2 LANDFILL EXPANSION PROJECT**.

1. Project Location: Unalaska Landfill Site, City of Unalaska
2. Owner: City of Unalaska, Department of Public Works and Utilities.

The project consists of constructing two new lined landfill cells with leachate pumping systems, site work/grading and all necessary work for a complete and operable project as shown on the Drawings and detailed in the Specifications.

Technical questions shall be directed in writing to Robert Lund, P.E., City Engineer, at the address shown below. An electronic copy of the Bidding Documents may be obtained from the Unalaska Department of Public Works Department or Bristol Engineering Services Corporation free of charge. A printed copy of the Bidding Documents may be obtained for \$125.00 from Bristol Engineering Services Corporation.

City of Unalaska
Department of Public Works
P.O. Box 610
Unalaska, Alaska 99685
Tel. 907-581-1260
Fax 907-581-2187

Bristol Engineering Services Corporation
111 W. 16th Avenue, Third Floor
Anchorage, Alaska 99501
Tel. 907-563-0013
Fax 907-563-6713

Each Bid must be submitted on the prescribed form and accompanied by bid security as prescribed in the Instruction to Bidders, payable to the City of Unalaska, Alaska, in an amount not less than 5 (five) percent of the Total Bid amount. The successful bidder will be required to furnish the necessary additional bond(s) for the faithful performance of the Contract, as prescribed in the Bidding Documents.

**Cells II-1 & II-2 and
Landfill Expansion**

**City of Unalaska
Unalaska, Alaska**

A joint prebid teleconference will be held on June 12, 2014, at 2:00 p.m. at the Bristol Engineering Services Corporation offices at 111 W. 16th Avenue, Third Floor, Anchorage, Alaska 99501. A site visit by all bidders is strongly recommended.

The successful Bidder shall hold such Contractors and Business Licenses as required by State Statutes and City of Unalaska Municipal Code Section 9.04. The right is reserved to reject any or all Bids, to waive informalities or irregularities in the bidding, and to accept bids that are considered to be in the best interest of the City of Unalaska.

No bidder may withdraw its bid after the time set for opening thereof, unless the award of the contract is delayed for a period exceeding 60 days.

Dated this 27 day of May, 2014.

CITY OF UNALASKA, ALASKA

By 
Dan Winters, Director of Public Utilities

SECTION 00100 – INSTRUCTIONS TO BIDDERS

PART 1 GENERAL

1.1 DEFINED TERMS

Terms used in these Instructions to Bidders which are defined in the General Conditions of the Contract Documents have the meanings assigned to them in the General Conditions.

Certain additional terms used in the Bidding Documents have the meanings indicated below which are applicable to both the singular and plural thereof.

- A. Bidder - one who submits a Bid directly to Owner as distinct from a subbidder, who submits a bid to a Bidder.
- B. Bidding Documents - the Bidding Requirements and the proposed Contract Documents (including all Addenda issued prior to receipt of Bids).
- C. Bidding Requirements - the Invitation to Bid, Instructions to Bidders, and Bid Form, plus additional documents that may be submitted with the Bid.
- D. Issuing Office - the City of Unalaska Public Works Department, from which the Bidding Documents are to be issued and where the bidding procedures are to be administered.
- E. Low Bidder - Low Bidder will be determined on the basis of the lowest Amount for the total bid including Owner chosen Additive and/or Deductive Bid Items as described in the Bid Form. Award of the Additive or Deductive Bid Items will be made to the extent that construction funds are available, in such order as may suit the best interest of the Owner. The Deductive and Additive Bid items are not in any specific order and are not listed in order of preference. The Owner reserves the right to select the low bidder on the basis of the Base Bid plus any combination of Additive and/or Deductive Bid items. If the order of the bids is affected, the award will be made on the basis of the Base Bid plus any combination of the Deductive and Additive Bid items.
- F. Successful Bidder - the lowest, qualified, responsible and responsive Bidder to whom the City (on the basis of the City's evaluation as hereinafter provided) makes an Award.

1.2 COPIES OF BIDDING DOCUMENTS

- A. Complete sets of the Bidding Documents for the sum stated in the Invitation to Bid may be obtained from the Issuing Offices.

- B. Complete sets of Bidding Documents must be used in preparing Bids; the City does not assume any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.
- C. The Drawings bound in the Contract Documents are at a scale indicated by a note or scale bar on the Drawings.
- D. The City, in making copies of Bidding Documents available on the above terms, does so only for the purpose of obtaining Bids for the work and does not confer a license or grant for any other use.

1.3 QUALIFICATIONS OF BIDDERS.

To demonstrate qualifications to perform the work, each Bidder must be prepared to submit within 5 days after Bid opening upon City's written request, information such as financial data, previous experience, present commitments, subcontractor names and qualifications, and other such data as may be called for below. Each Bid must contain evidence of Bidder's qualification to do business in Alaska and the City of Unalaska.

Nothing indicated herein should prejudice the right of Owner to seek additional pertinent information as provided in the General Conditions.

1.4 LICENSE REQUIREMENTS

Contractors and subcontractors, in order to perform public work in the State of Alaska, are required to hold State of Alaska Contractor's licenses of the class required to perform the specified work. Contractors and subcontractors are also required to hold current Alaska Business Licenses and City of Unalaska businesses licenses in order to perform public work in the State of Alaska. Contractor's license and Business License numbers shall be inserted in the appropriate place on the Bid form. Evidence of subcontractor's compliance with the above shall be submitted to the City before starting subcontract work on public work contracts.

1.5 EXAMINATION OF CONTRACT DOCUMENTS AND SITE.

- A. It is the responsibility of each Bidder before submitting a Bid:
 - 1. To examine thoroughly the Contract Documents and other related data identified in the Bidding Documents (including "technical data" referred to below);
 - 2. To visit the site to become familiar with and satisfy Bidder as to the general, local, and site conditions that may affect cost, progress, performance, or furnishing of the Work;
 - 3. To consider federal, state, and local Laws and Regulations that may affect cost, progress, performance, or furnishing of the Work;
 - 4. To study and carefully correlate Bidder's knowledge and observations with the Contract Documents and such other related data;

5. To promptly notify the City of all conflicts, errors, ambiguities or discrepancies which Bidder has discovered in or between the Contract Documents and such other related documents;
 6. To review applicability of the City of Unalaska sales tax to any purchases of materials or services related to the Work.
 7. To review applicability of City of Unalaska personal property tax to any equipment or personal property located in Unalaska.
- B. Information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the site is based upon information and data furnished to the City by Owners of such Underground Facilities or others, and the City does not assume responsibility for the accuracy or completeness thereof unless it is expressly provided otherwise in the Supplementary Conditions.
1. Information pertaining to subsurface explorations, borings, test holes, and other preliminary investigations appears in the bidding documents. This information was acquired for design purposes only and is not considered adequate for construction. The Owner does not warrant the correctness of the soils investigation or any interpretation, deduction, or conclusion given in the data relative to subsurface conditions. The Bidder shall make his own deductions and conclusions as to the nature of the materials to be excavated, the difficulties of making and maintaining the required excavations, the difficulties that may arise from the subsurface conditions, and any other work affected by the subsurface conditions, and shall accept full responsibility thereof.
 2. Excavation is unclassified and includes all excavation, over-excavation and backfill necessary to perform the work, regardless of character or type of materials and obstructions or other hindrances encountered. The Contractor shall perform all excavation of every description and whatever substance encountered, including rock and dewatering or diversion of water.
- C. Provisions concerning responsibility for the adequacy of data furnished to prospective Bidders on subsurface conditions, other physical conditions and Underground Facilities, and possible changes in the Contract Documents due to differing or unanticipated conditions appear in Article 4 of the General Conditions.
- D. Before submitting a Bid, each Bidder will be responsible to make or obtain such examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the site or otherwise which may affect cost, progress, performance, or furnishing of the Work or which relate to any aspect of the means, methods, techniques, sequences, or procedures of construction to be employed by Bidder and safety precautions and programs incident thereto or which Bidder deems necessary to determine its Bid for performing and

furnishing the Work in accordance with the time, price, and other terms and conditions of the Contract Documents.

- E. On request, the City will provide each Bidder access to the site to conduct such examinations, investigations, explorations, tests and studies as each Bidder deems necessary for submission of a Bid. Bidder shall fill all holes and clean up and restore the site to its former condition upon completion of any such explorations, investigations, test, and studies.
- F. The submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article 5; that, without exception, the Bid is premised upon performing and furnishing the work required by the Contract Documents and applying the specific means, methods, techniques, sequences, or procedures of construction (if any) that may be shown or indicated or expressly required by the Contract Documents; that Bidder has given the Contracting Officer written notice of all conflicts, errors, ambiguities, and discrepancies that Bidder has discovered in the Contract Documents and the written resolution thereof by the City is acceptable to Bidder; and that the Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the Work.
- G. The provisions of paragraph 5A through 5F above, inclusive, do not apply to asbestos, polychlorinated biphenyl (PCB), petroleum, hazardous waste, or radioactive material covered by the Supplementary Conditions.
- H. Nothing contained in the Bid Documents, any and all attachments thereto, or any and all addenda thereto, shall be interpreted by any party as requiring or allowing the Contractor to do anything that is not in compliance with all applicable codes and regulations, that is less than general standard industry quality, or that results in an unsafe, unstable or dangerous condition.

1.6 AVAILABILITY OF LANDS FOR WORK, ETC.

The lands upon which the work is to be performed, rights-of-way and easements for access thereto, and other lands designated for use by Contractor in performing the work are identified in the Contract Documents. All additional lands and access thereto required for temporary construction facilities, construction equipment, or storage of materials and equipment to be incorporated in the work are to be obtained and paid for by the Successful Bidder. Easements for permanent structures or for permanent changes in existing facilities are to be obtained and paid for by the City unless otherwise provided in the Contract Documents.

1.7 INTERPRETATIONS AND ADDENDA.

- A. All questions about the meaning or intent of the Bidding Documents are to be directed to the City of Unalaska. Interpretations or clarifications considered necessary by the City in response to such questions will be issued by Addenda

mailed or delivered to all parties recorded by the Issuing Office as having received the Bidding Documents. Questions received less than 6 days prior to the date for opening of Bids may not be answered. Only questions answered by formal written Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.

- B. Addenda may also be issued to modify the Bidding Documents as deemed advisable by the City.

1.8 BID SECURITY

- A. Each Bid must be accompanied by Bid security made payable to Owner for 5 percent of Bidder's Total Bid price and in the form of a certified bank check or a Bid Bond on form attached, issued by a Surety meeting the requirements of the General Conditions.
- B. The Bid security of a successful bidder will be retained until such Bidder has executed the Agreement, furnished the required Contract security, and met the other conditions of the Notice of Award, whereupon the Bid security will be returned. If the successful Bidder fails to execute and deliver the Agreement and furnish the required Contract security within 15 days after the Notice of Award, Owner may annul the Notice of Award and the Bid security of that Bidder will be forfeited. The bid security of the Bidders whom Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of the 7th day after the Effective Date of the agreement or the 60th day after the Bid opening, whereupon Bid security furnished by such Bidders will be returned. Bid security submitted with bids which are not competitive will be returned within 15 days after the Bid opening.

1.9 CONTRACT TIMES

The number of days within which, or the dates by which, the work is to be completed and ready for final payment (the Contract Times as defined in Article 1 of the General Conditions) are set forth in the Agreement (or incorporated therein by reference to the attached Bid Form).

1.10 LIQUIDATED DAMAGES

Provisions for liquidated damages, if any, are set forth in the Agreement.

1.11 BID FORM

- A. The Bid Form is included with the Bidding Documents.
- B. All blanks on the Bid Form must be completed by printing in black ink or by typewriter.

- C. Bids by corporations must be executed in the corporate name by the president or a vice-president (or other corporate officer accompanied by evidence of authority to sign) and the corporate seal must be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporation must be shown below the signature.
- D. Bids by partnership must be executed in the partnership name and signed by a partner, whose title must appear under the signature and the official address of the partnership must be shown below the signature.
- E. All names must be typed or printed in black ink below the signature.
- F. The Bid shall contain an acknowledgment of receipt of all Addenda (the numbers of which must be filled in on the Bid Form).
- G. The address, telephone, email address, and FAX number for communications regarding the Bid must be shown.
- H. See Article 4 above, for required evidence of authority to conduct business as an out-of-state corporation in Alaska. State Contractor license number, if any, must also be shown.

1.12 SUBMISSION OF BIDS.

- A. Bids shall be submitted not later than the time prescribed, at the place, and in the manner set forth in the Invitation to Bid and shall be enclosed in an opaque sealed envelope, marked with the project title (and, if applicable, the designated portion of the project for which the Bid is submitted) and name and address of Bidder and accompanied by the other required documents. If the Bid is sent through the mail or other delivery system, the sealed envelope shall be enclosed in a separate envelope with the notation "BID ENCLOSED" on the face of it.
- B. Only one Bid from any individual, firm, partnership, or corporation, under the same or different names, will be considered. Should it appear to the City that any Bidder is interested in more than one Bid for work contemplated, all Bids in which such Bidder is interested will be rejected.
- C. Attachments

Bidder shall complete and submit the following forms with its Bid:

- Bid Form
- Addenda Acknowledgment
- Alaska Bid Bond (5% of Bid)
- Alaska Business and Contractor's License

1.13 MODIFICATIONS AND WITHDRAWAL OF BIDS.

- A. Prior to the time and date designated for receipt of Bids, any Bid submitted may be withdrawn by notice to the party receiving Bids at the place designated for receipt of Bids. Such notice shall be in writing over the signature of the Bidder or by facsimile. If by facsimile, the modification received shall be over the signature of the Bidder and shall be received before the date and time set for receipt of Bids. Facsimile messages shall be worded as to not reveal the amount of the original or modified Bid. Facsimile telephone number is:

City of Unalaska (907) 581-1417
Bristol Engineering Services Corporation (907) 563-6713

Bid modifications must be sent to the office to which the original proposal is delivered or sent.

- B. If, within 24 hours after Bids are opened, any Bidder files a duly signed, written notice with the City and promptly thereafter demonstrates to the reasonable satisfaction of the City that there was a material and substantial mistake in the preparation of its Bid, that Bidder may withdraw its Bid. Thereafter, that Bidder will be disqualified from further consideration on the Work to be provided under the Contract Documents.

1.14 OPENING OF BIDS

Bids will be opened and read aloud publicly at the place where Bids are to be submitted.

1.15 BIDS TO REMAIN SUBJECT TO ACCEPTANCE

All Bids will remain subject to acceptance for 60 days after the day of the Bid opening, but the City may, in its sole discretion, release any Bid and return the Bid security prior to that date.

1.16 AWARD OF CONTRACT

- A. The City reserves the right to reject any or all Bids, including without limitation the rights to reject any or all nonconforming, non responsive, unbalanced or conditional Bids, and to reject the Bid of any Bidder if the City believes that it would not be in the best interest of the Project to make an award to that Bidder, whether because the Bid is not responsive or the Bidder is unqualified or of doubtful financial ability or fails to meet any other pertinent standard or criteria established by Owner. The City also reserves the right to waive all informalities not involving price, time, or changes in the Work and to negotiate Contract terms with the successful Bidder. Discrepancies in the multiplication of units of work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum

of any column of figures and the correct sum thereof will be resolved in favor of the correct sum. Discrepancies between words and figures will be resolved in favor of the words.

- B. In evaluating Bids, the City will consider the qualifications of Bidders, whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices, and other data, as may be requested in the Bid Form or prior to the Notice of Award.
- C. The City may consider the qualifications and experience of subcontractors, suppliers, and other persons and organizations proposed for those portions of the Work as to which the identity of subcontractors, suppliers, and other persons and organizations must be submitted as provided in the Supplementary Conditions. The City also may consider the operating costs, maintenance requirements, performance data, and guarantees of major items of materials and equipment proposed for incorporation in the Work when such data are required to be submitted prior to the Notice of Award.
- D. The City may conduct such investigations as the City deems necessary to assist in the evaluation of any Bid and to establish the responsibility, qualifications, and financial ability of Bidders, proposed subcontractors, suppliers, and other persons and organizations to execute the work in accordance with the Contract Documents to the City's satisfaction within the prescribed time.
- E. If, at the time this Contract is to be awarded, the total of the lowest acceptable Bid exceeds the funds then estimated by the City as available, the City may reject all Bids or take such other action as best serves the City's interests.
- F. If the Contract is to be awarded, it will be awarded to lowest Bidder as stated in Section 00100 Instructions To Bidders, whose evaluation by the City indicates to the City that the award will be in the best interests of the Project.
- G. In the event of failure of the lowest responsive, responsible Bidder to sign the Contract and provide an acceptable Performance Bond, Payment Bond, and insurance certificate(s), the Owner may award the Contract to the next lowest responsive, responsible Bidder. Such award, if made, will be made within 60 days after the opening of Proposals.
- H. An Additive or Deductive Bid Item is an amount proposed by Bidders and stated on the Bid Form for certain construction activities defined in the Bidding Requirements that may be added to or deducted from the Base Bid amount if the Owner decides to accept a corresponding change in either the amount of construction to be completed, or in the products, materials, equipment, systems or installation methods described in the Contract Documents.

- I. Award of the Additive or Deductive Bid Items will be made to the extent that construction funds are available, in such order as may suit the best interest of the Owner. The Deductive and Additive Bid items are not in any specific order and are not listed in order of preference. The Owner reserves the right to select the Base Bid plus any combination of Additive and/or Deductive Bid items. If the order of the bids is affected, the award will be made on the basis of the Base Bid plus any combination of Additive or Deductive Bid items that the Owner selects at their option.

1.17 CONTRACT SECURITY

Article 5 of the General Conditions sets forth Owner's requirements as to Performance and Payment Bonds. When the successful Bidder delivers the executed Agreement to Owner, it must be accompanied by the required Performance and Payment Bonds.

1.18 SIGNING OF AGREEMENT

When the City gives a Notice of Award to the successful Bidder, it will be accompanied by the required number of unsigned counterparts of the Agreement, with all other written Contract Documents attached. Within 10 days thereafter, contractor shall sign and deliver the required number of counterparts of the Agreement and attached documents to the City with the required Bonds. Within 10 days thereafter, the City shall deliver one fully signed counterpart to Contractor.

1.19 WAGES

All workers shall be paid prevailing wage rates as described in the current State of Alaska LABORERS' AND MECHANICS' MINIMUM RATES OF PAY, Title 36, Public Contracts, AS 36.05 & AS 35.10 Wage and Hour Administration Pamphlet No. 600. This is included as Appendix B.

Refer to Appendix C for Attachment 6 "Wage Rate Requirements Under FY2010 Appropriations." This attachment is a companion document to Pamphlet 600, and is required for projects receiving EPA-funded Clean Water revolving loan funds.

1.20 DBE AND EEO REQUIREMENTS

The selected Contractor will be required to certify compliance with certain Disadvantaged Business Enterprises (DBE) and Equal Employment Opportunity (EEO) programs. Necessary information and forms are provided in Appendix F of these Contract Documents. The selected Contractor will be responsible for reporting and submission of the required forms to the State of Alaska in a timely and correct manner.

NOTE TO BIDDER: Use BLACK ink or typewriter for completing this Bid Form.

SECTION 00300 – BID FORM

To: **City of Unalaska, Department of Public Works**
Address: **P.O. Box 610, Unalaska, Alaska 99685**
Project Identification: **CELLS II-1 AND II-2 LANDFILL EXPANSION
PROJECT**

DEFINITIONS

The terms used in this Bid which are defined in the General Conditions and Instructions to Bidders included as part of the Contract Documents are used with the same meaning in this Bid.

BIDDERS DECLARATION AND UNDERSTANDING

This Bid is genuine and not made in the interest of or on behalf of any undisclosed person, firm, or corporation and is not submitted in conformity with any agreement or rules of any group, association, organization, or corporation; Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid; Bidder has not solicited or induced any person, firm, or corporation to refrain from bidding; and Bidder has not sought by collusion to obtain for itself any advantage over any other Bidder or over the City.

In submitting this Bid, Bidder represents, as more fully set forth in the Agreement, that Bidder has examined copies of all the Bidding Documents.

Bidder has familiarized itself with the nature and extent of the Contract Documents, work, site, locality, general nature of work to be performed by Owner or others at the site that relates to work for which this Bid is submitted as indicated in the Contract Documents, and all local conditions and all federal, state, and local Laws and Regulations that in any manner may affect cost, progress, performance, or furnishing of the work.

Bidder has reviewed and checked all information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the site and assumes responsibility for the accurate location of said Underground Facilities. No additional examinations, investigations, explorations, tests, reports, or similar information or data in respect of said Underground Facilities are or will be required by Bidder in order to perform and furnish the work at the Contract Price, within the Contract Time, and in accordance with the other terms and conditions of the Contract Documents, including specifically the provisions of paragraph 4.3 of the General Conditions.

Bidder has correlated information known to Bidder and the results of all such observations, examinations, investigations, explorations, tests, and studies with the Contract Documents.

Bidder has given the City written notice of all conflicts, errors, ambiguities or discrepancies that it has discovered in the Contract Documents and the written resolution thereof by the City is acceptable to Bidder, and the Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the work for which this Bid is submitted.

CONTRACT EXECUTION AND BONDS

The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an agreement with the City in the form included in the Contract Documents to perform and furnish all work as specified or indicated in the Contract Documents for the Contract price and within the Contract Time indicated in this Bid and in accordance with the other terms and conditions of the Contract Documents.

Bidder accepts all of the terms and conditions of the Invitation to Bid and Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for 60 days after the day of Bid opening. Bidder will sign and deliver the required number of counterparts of the Agreement with the Bonds and City of Unalaska business license and other documents required by the Bidding Requirements within 10 days after the date of Owner's Notice of Award.

CERTIFICATE OF INSURANCE

Bidder agrees to furnish the City, before commencing any Physical Work related to this Contract and as required elsewhere, the certificates of insurance as specified in these Documents.

Bidder further agrees that the amount stated herein includes specific consideration for the insurance coverages, including contractual liability, specified in the Contract Documents.

CONTRACT COMPLETION TIME

Bidder agrees that the work will be completed and ready for final payment in accordance with the number of calendar days or completion date indicated in the Agreement.

LIQUIDATED DAMAGES

Bidder accepts the provisions of the Agreement as to liquidated damages in the event of failure to complete the work within the times specified in the Agreement.

ADDENDA

The Bidder hereby acknowledges that it has received Addenda No's _____, _____, _____, _____, _____ (Bidder shall insert No. of each Addendum received) and agrees that all addenda issued are hereby made part of the Contract Documents, and the Bidder further agrees that its Bid(s) includes all impacts resulting from said addenda.

SALES AND USE TAXES

The Bidder agrees that all sales and use taxes are included in the stated bid prices for the work, unless provision is made herein for the Bidder to separately itemize the estimated amount of sales tax.

SUBCONTRACTORS

The Bidder further agrees that if the bid is the apparent low bid, he shall submit, within 5 days after the bid opening, a listing of subcontracting firms or businesses that will be awarded subcontracts for work in excess of \$5,000 and a copy of the City of Unalaska business license for each Subcontractor.

BID TABULATION AND SUMMARY

The Bidder further proposes to accept, as full payment for work proposed herein, the amount computed under provisions of the Contract Documents and based on the following Bid amounts, it being expressly understood that the unit quantities of work shown on the plans is independent of the exact quantities involved. The Bidder agrees that the bid amount represent(s) a true measure of the labor and materials required to furnish, install, or provide the item of Work, including all allowances for overhead and profit. The amount shall be shown in both words and figures. In case of a discrepancy, the amount shown in words shall govern.

Bidder agrees to perform all of the work described in the Documents including the specifications, special provisions, and as generally shown on the plans for the prices stated in the Bid Schedules. Bidder understands that the Owner reserves the right to reject any or all bids and to waive any informalities in the bidding.

CITY OF UNALASKA

CELLS II-1 AND II-2 LANDFILL EXPANSION PROJECT

BIDDER

If the Bidder is awarded a construction Contract on this Proposal, the surety who provides the Performance Bond and Payment Bond will be _____

whose address is _____,

_____ , _____

Street

City

_____.

State

Zip

BIDDER

An Individual

By

_____ (SEAL)

(Individual's name)

doing business as

Business

address: _____

Phone No.: _____

Fax No.: _____

Email address: _____

A Partnership

By _____ (SEAL)

(Firm name)

(general partner)

Business address: _____

Phone No.: _____

Fax No.: _____

Email address: _____

A Corporation

By _____

(Corporation name)

(state of incorporation)

By _____

(name of person authorized to sign)

(Title)

(Corporate Seal)

Attest _____

(Secretary)

Business address: _____

Phone No.: _____

Fax No.: _____

Email address: _____

A Joint Venture

By _____
(Name)

(Address)

By _____
(Name)

(Address)

Phone Number and Address for receipt of official communications

Business address: _____

Phone No.: _____

Fax No.: _____

Email address: _____

(Each joint venturer must sign. The manner of signing for each individual, partnership, and corporation that is a party to the joint venture should be in the manner indicated above.)

SUBMITTED on _____, 20____.

**BID PROPOSAL
City of Unalaska
CELLS II-1 AND II-2 LANFILL EXPANSION**

ITEM NO.	SPEC NO.	EST. QUANT.	DESCRIPTION (Write Unit Bid Price in Words)	UNIT PRICE	TOTAL PRICE
1.	01100.1.6.A.1	All	Site Mobilization and Demobilization _____		
			per lump sum		
2.	01100.1.6.A.2	All	Site Preparation and Earthwork _____		
			per lump sum		
3.	01100.1.6.A.3	All	Liner System _____		
			per lump sum		
4.	01100.1.6.A.4	All	Leachate Collection and Conveyance System _____		
			per lump sum		
5.	01100.1.6.A.5	850	Over Excavation and Backfill _____		
			per cubic yard		
6.	01100.1.6.A.6	All	Site Restoration/Cleanup/Record Drawings _____		
			per lump sum		
7.	01100.1.6.A.7	3840	Provide, Install and Compact 2" to 8" Quarry Spoils _____		
			per ton		

Total Bid Price: _____

Total Bid Price (in words): _____

Bidding Company: _____

Name (Printed): _____

Signature: _____ Date: _____

Contractor's License No. _____ Business License No. _____

BID BOND

KNOW ALL MEN BY THESE PRESENTS: that

(Name of Contractor)

(Address of Contractor)

as Principal, hereinafter called Principal, and

(Name of Surety)

(Address of Surety)

a corporation duly organized under the laws of the State of Alaska as Surety, hereinafter called Surety, are held and firmly bound unto

City of Unalaska

(Name of Owner)

PO Box 610, Unalaska, Alaska 99685

(Address of Owner)

as Obligee, hereinafter called Obligee, in the sum of _____
Dollars, (\$ _____) for the payment of which sum well and truly to be made, the said Principal and the said Surety, bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has submitted a bid for the City of Unalaska **CELLS II-1 AND II-2 LANDFILL EXPANSION PROJECT** located in Unalaska, Alaska.

NOW THEREFORE, if the Obligee shall accept the bid of the Principal and the Principal shall enter into a Contract with the Obligee in accordance with the terms of such bid, and give such bond or bonds as may be specified in the bidding or Contract Documents with good and sufficient surety for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof, or in the event of the failure of the Principal to enter such Contract and give such bond or bonds, if the Principal shall pay to the Obligee the difference not to exceed the penalty hereof between the amount specified in said bid and such larger amount for which the Obligee may in good faith contract with another party to perform the Work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect.

Signed and Sealed this _____ day of _____ 2014

(Principal) Seal

(Witness)

(Title) Seal

(Surety) Seal

(Witness)

(Title) Seal

Part 2
CONTRACT FORMS

**SECTION 00500 – STANDARD FORM OF AGREEMENT
BETWEEN THE OWNER AND CONTRACTOR**

THIS AGREEMENT is dated as of the _____ day of _____ in the year 2013, by and between the City of Unalaska (hereinafter called OWNER) and _____ (hereinafter called CONTRACTOR).

OWNER and CONTRACTOR, in consideration of the mutual covenants hereinafter set forth, agree as follows:

Article 1. WORK

CONTRACTOR shall complete all work as specified or indicated in the Contract Documents. The work is generally described as follows:

The work will include, but not be limited to, furnishing all labor, tools, equipment, and materials and performing all operations in connection with the **CELLS II-1 AND II-2 LANFILL EXPANSION**.

1. Project Location: Unalaska Landfill Site, City of Unalaska/Dutch Harbor
2. Owner: City of Unalaska, Department of Public Works and Utilities.

The project consists of constructing two new lined landfill cells with leachate pumping systems, site work/grading and all necessary work for a complete and operable project as shown on the Drawings and detailed in the Specifications.

Article 2. CONTRACT TIME

- 2.1 The **CONTRACTOR shall have until September 1, 2015, for substantial completion, and until September 30, 2015 for final completion** of this project.
- 2.2 Liquidated Damages. The OWNER and CONTRACTOR recognize that time is of the essence of this Agreement and that the OWNER will suffer financial loss if the work is not completed within the times specified above, plus any extensions thereof allowed in accordance with Article 11 of the General Conditions. They also recognize the delays, expense, and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by the OWNER if the work is not completed on time. Accordingly, instead of requiring any such proof, the OWNER and CONTRACTOR agree that as liquidated damages for delay (but not as a penalty) CONTRACTOR shall pay the OWNER Three Thousand Dollars (\$3,000.00) for each day that expires after the time specified above for completion and readiness for final payment.

Article 3. CONTRACT PRICE

- 3.1 The OWNER shall pay CONTRACTOR for completion of the work in accordance with the Contract Documents an amount equal to the sum of the Lump Sum prices for each separately identified item including any Additive Alternate Items plus the sum of any Unit Price work items multiplied by the measured quantity of actual items installed (herein referred to as the "Contract Sum").
- 3.2 The Contract sum is based upon the Bid Items which are set forth in the Contract Documents and which are hereby accepted by the OWNER.

Article 4. PAYMENT PROCEDURES

CONTRACTOR shall submit Applications for Payment in accordance with Article 13 of the General Conditions. Applications for Payment will be processed by the OWNER as provided in the General Conditions.

- 4.1. Progress Payments. The OWNER shall make progress payments on account of the Contract Price on the basis of CONTRACTOR's Applications for Payment on or about a day of the month mutually agreeable to the OWNER and CONTRACTOR as agreed to at the preconstruction conference. All progress payments will be on the basis of the progress of the work measured by the actual installed quantity of items, plus allowances for stockpiled materials.
- 4.1.1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below, but, in each case, less the aggregate of payments previously made and less such amounts as the OWNER shall determine, or the OWNER may withhold, in accordance with Article 13 (paragraph 13.8) of the General Conditions and the Supplemental Conditions.
- a. Ninety percent of work completed.
 - b. Once 50 percent of the work is complete as determined by the OWNER, and if the character and progress of the work have been satisfactory to the OWNER, the OWNER, may determine that, as long as the character and progress of the work remain satisfactory to them, there will be no additional retainage on account of work completed; in which case, the remaining progress payments prior to Substantial Completion will be in an amount equal to 100 percent of the work completed.
- 4.1.2. Upon Substantial Completion, in an amount sufficient to increase total payments to CONTRACTOR to 95 percent of the Contract Price, less such amounts as the OWNER shall determine, or the OWNER may withhold, in accordance with Article 13 of the General Conditions.
- 4.2. Final Payment. Upon final completion and acceptance of the work in accordance with the General Conditions; Affidavit of Payment of Debts and Claims; Affidavit of Release

of Liens; and Receipt of Consent of Surety Company to Final Payment, the OWNER shall pay the remainder of the Contract Price as provided in said Article 13.

4.2.1 Deductions. The City may deduct from the amount of any payment made to Contractor any sums owed to City by Contractor including, but not limited to, past due sales tax, port and harbor fees, property tax, or rent. Before making any such deduction the City shall have provided Contractor written notice of the amount claimed by City to be due and owing from Contractor.

Article 5. INTEREST ON RETAINAGE

All retainage shall bear interest at the rate required by AS 36.90.250, if applicable.

Article 6. CONTRACTOR'S REPRESENTATIONS

In order to induce the OWNER to enter into this agreement, CONTRACTOR makes the following representations:

- 6.1. CONTRACTOR has familiarized itself with the nature and extent of the Contract Documents, work, site, locality, and all local conditions and Laws and Regulations that in any manner may affect cost, progress, performance, or furnishing of the work.
- 6.2. CONTRACTOR has obtained and carefully studied (or assumes responsibility for obtaining and carefully studying) all such examinations, investigations, explorations, tests, reports, and studies which pertain to the subsurface or physical conditions at or contiguous to the site or which otherwise may affect the cost, progress, performance, or furnishing of the work as CONTRACTOR considers necessary for the performance or furnishing of the work at the Contract Price, within the Contract Time, and in accordance with the other terms and conditions of the Contract Documents, including specifically the provisions of paragraph 4.2 of the General Conditions; and no additional examinations, investigations, explorations, tests, reports, studies, or similar information or data are or will be required by CONTRACTOR for such purposes.
- 6.3. CONTRACTOR has reviewed and checked all information and data shown or indicated on the Contract Documents with respect to existing Underground Facilities at or contiguous to the site and assumes responsibility for the accurate location of said Underground Facilities. No additional examinations, investigations, explorations, tests, reports, studies, or similar information or data in respect of said Underground Facilities are or will be required by CONTRACTOR in order to perform and furnish the work at the Contract Price, within the Contract Time, and in accordance with the other terms and conditions of the Contract Documents, including specifically the provisions of paragraph 4.4 of the General Conditions.

- 6.4. CONTRACTOR has correlated the results of all such observations, examinations, investigations, explorations, tests, reports, and studies with the terms and conditions of the Contract Documents.
- 6.5. CONTRACTOR has given the OWNER written notice of all conflicts, errors, or discrepancies that it has discovered in the Contract Documents and the written resolution thereof by the OWNER is acceptable to CONTRACTOR.

Article 7. MISCELLANEOUS

- 7.1. Terms used in this Agreement which are defined in Article 1 of the General Conditions will have the meanings indicated in the General Conditions.
- 7.2. The CONTRACTOR shall submit the Performance Bond, Labor and Material Payment Bonds, and Certification of Insurance and City of Unalaska business licenses and all Subcontractor City of Unalaska business licenses as required by the Contract Documents, prior to commencement of the Work. The Performance and Material Payment Bonds shall be in the amount of 100% of the contract bid price.
- 7.3. No assignment by a party hereto of any rights under or interests in the Contract Documents will be binding on another party hereto without the written consent of the party sought to be bound; and specifically but without limitation monies that may become due and monies that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.
- 7.4. OWNER and CONTRACTOR each binds itself, its partners, successors, assigns, and legal representatives to the other party hereto, its partners, successors, assigns, and legal representatives in respect of all covenants, agreements, and obligations contained in the Contract Documents.
- 7.5. 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.

IN WITNESS WHEREOF, The OWNER and CONTRACTOR have signed all counterparts of this Agreement. All portions of the Contract Documents have been signed or identified by the OWNER and CONTRACTOR.

This Agreement will be effective on _____, 2014.

CITY OF UNALASKA

CONTRACTOR _____

By _____ By _____
Chris Hladick, City Manager

(CORPORATE SEAL)

(CORPORATE SEAL)

Attest _____ Attest _____
City Clerk

Address for giving notices
PO Box 610
Unalaska, Alaska 99685

Address for giving notices

SECTION 00610 – PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS: that

(Name of Contractor)

(Address of Contractor)

as Principal, hereinafter called Principal, and

(Name of Surety)

(Address of Surety)

as Surety, hereinafter called Surety, are held and firmly bound unto

City of Unalaska
(Name of Owner)

PO Box 610, Unalaska, Alaska 99685
(Address of Owner)

as Obligee, hereinafter called Obligee, in the sum of _____

_____ Dollars, (\$ _____) for the payment of which sum well and truly to be made, the said Principal and the said Surety, bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Contractor has a written agreement dated _____ day of _____
_____ 20 ____, entered into a Contract with Owner for the

City of Unalaska
CELLS II-1 AND II-2 LANDFILL EXPANSION PROJECT

in accordance with the Plans and Specifications prepared by the **Bristol Engineering Services Corporation**, which Contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

NOW THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if Contractor shall promptly and faithfully perform said Contract, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

The Surety hereby waives notice of any alteration or extension of time made by the Owner.

Whenever Contractor shall be, and declared by Owner to be in default under the Contract, the Owner having performed Owner'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 completing the Contract in accordance with its terms and conditions, and upon determination by Surety of the lowest responsible bidder, or, if the Owner elects, upon determination by the Owner and the Surety jointly of the lowest responsible bidder, arrange for a contract between such bidder and Owner, and make available as the Work progresses (even though there should be a default or a succession of defaults under the contract or contracts 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 Owner to the Contractor under the Contract and any amendments thereto, less the amount properly paid by Owner to Contractor.

Any suit under this bond must be instituted before the expiration of six (6) years from the date on which final payment under the Contract falls due.

No right of action shall accrue on this bond to or for the use of any person or corporation other than the Owner named herein or the heirs, executors, administrators, or successors of the Owner.

Signed and Sealed this _____ day of _____ 20__.

_____	(Principal)	Seal	
(Witness)	_____	(Title)	Seal
_____	(Surety)	Seal	
(Witness)	_____	(Title)	Seal

SECTION 00620 – PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS,

That _____ as Contractor, and
_____ as Surety, are held and firmly bound unto
City of Unalaska hereinafter called “OWNER”, in the sum of _____ dollars,
for the
payment of which sum, well and truly made, we bind ourselves, our heirs, executors,
administrators, successors, and assigns, jointly and severally, firmly by these presents.

WHEREAS, said CONTRACTOR has been awarded and is about to enter into the annexed
Agreement with said OWNER to perform the WORK as specified or indicated in the
Contract Documents entitled

City of Unalaska
CELLS II-1 AND II-2 LANDFILL EXPANSION PROJECT

NOW THEREFORE, if said CONTRACTOR, or subcontractor, fails to pay for any
materials, equipment, or other supplies, or for rental of same, used in connection with the
performance of work contracted to be done, or for amounts due under applicable State law
for any work or labor thereon, said Surety will pay for the same in an amount not exceeding
the sum specified above, and, in the event suit is brought upon this bond, a reasonable
attorney’s fee to be fixed by the court. This bond shall inure to the benefit of any persons,
companies, or corporations entitled to file claims under applicable State law.

PROVIDED, that any alterations in the WORK to be done or the materials to be furnished, or
changes in the time of completion, which may be made pursuant to the terms of said Contract
Documents, shall not in any way release said CONTRACTOR or said surety thereunder, nor
shall any extensions of time granted under the provisions of said Contract Documents release
either said CONTRACTOR or said Surety thereunder, nor shall any extensions of time
granted under the provisions of said Contract Documents release either said CONTRACTOR
or said Surety, and notice of such alterations or extensions of the Agreement is hereby
waived by said Surety.

SIGNED AND SEALED, this _____ day of _____, 20____.

(SEAL)

(CONTRACTOR)

(Surety)

By: _____
(Signature)

By: _____
(Signature)

(SEAL AND NOTARIAL ACKNOWLEDGMENT OF SURETY)

Part 3

GENERAL CONDITIONS

SECTION 00800 – SUPPLEMENTARY CONDITIONS

REFERENCE: 1. "GENERAL CONDITIONS OF THE CONTRACT", constitutes the General Conditions of this Contract and is further revised and supplemented by the provisions of these Supplementary Conditions to the Contract, hereinafter called the "Supplementary Conditions." The General Conditions and the Supplementary Conditions are applicable to all of the Work under this Contract and shall apply to the Contractor and all Subcontractors.

SUPPLEMENTS: 2. The following supplements modify, change, delete, or add to the General Conditions. Where any article of the General Conditions is modified or any paragraph deleted, subparagraph or clause thereof is modified, or deleted by these supplements, the unaltered provisions of such article, paragraph, subparagraph or clause shall remain in effect.

SC-1 ARTICLE 1 – DEFINITIONS, Add the following:

1.1 Supplemental Specifications

1.1.1 The **ALASKA DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES (ADOTPF) STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION**, 2004 Edition, are hereby incorporated and become a part of these Contract Documents.

SC-2 ARTICLE 1 - DEFINITIONS, Add the following:

OWNER – The OWNER and CONTRACTING OFFICER are further defined as:

City of Unalaska
Department of Public Works
P.O. Box 610
Unalaska, Alaska 99685-0610
Tel. (907) 581-1260
FAX (907) 581-2187
Attn: Tom Cohenour, Director of Public Works
Email: tcohenour@ci.unalaska.ak.us

ENGINEER – The ENGINEER is further defined as:

Bristol Engineering Services Corporation
111 W. 16th Avenue, Third Floor
Anchorage, AK 99501
Tel. (907) 563-0013
Attn: Jim Vogel, P.E.
Email: jvogel@bristol-companies.com

SC-3 ARTICLE 4 - LANDS AND PHYSICAL CONDITIONS, Add the following section:

4.8 HAZARDOUS MATERIALS

- A. OWNER shall be responsible for any Asbestos, PCB's, Petroleum, or Hazardous Waste, uncovered or revealed at the site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of WORK and which may present a substantial danger to persons or property exposed thereto in connection with the WORK at the site. OWNER will not be responsible for any such material brought to the site by the CONTRACTOR, Subcontractors, Suppliers, or anyone else for whom CONTRACTOR is responsible.
- B. CONTRACTOR shall immediately stop all WORK in connection with such hazardous condition and any area affected thereby (except in an emergency as required in the General Conditions), and notify OWNER and ENGINEER (and thereafter confirm such notice in writing). OWNER will promptly consult with ENGINEER concerning the necessity for OWNER to retain a qualified expert to evaluate such hazardous condition or take corrective action, if any. CONTRACTOR shall relocate and resume Work in an area that does not have contamination or hazardous conditions so that no delays are experienced. Delay claims for encountering contamination or hazardous conditions are invalid unless there is no other work that can be accomplished under the Contract. CONTRACTOR shall not be required to resume WORK in connection with such hazardous condition or in any such affected area until after OWNER has obtained any required permits related thereto, and delivered to CONTRACTOR special written notice. Such written notice will specify that such condition and any affected area is or has been rendered safe for resumption of the WORK or specify any special conditions under which such WORK may be resumed safely. If OWNER and CONTRACTOR cannot agree as to entitlement to or the amount or extent of adjustment for work resumed in the hazardous conditions, if any, in Contract Price or Contract Times as a result of such WORK stoppage or such special conditions under which WORK is agreed by CONTRACTOR to be resumed, either party may make a claim therefore as provided in Articles 10 and 11.”

SC-4 ARTICLE 11 - CONTRACT TIME; COMPUTATION AND CHANGE

11.2 Starting the Work; Change the second sentence to read as follows:

“CONTRACTOR shall notify the Contracting Officer at least fourteen (14) days in advance of the time actual construction operations will begin.”

SC-5 ARTICLE 11 - CONTRACT TIME; COMPUTATION AND CHANGE

11.5 Extension Due to Delays; Add the following sentence:

“Normal weather in Unalaska shall not be cause for time extension and the CONTRACTOR shall allow ample time in his schedule to accommodate normal weather delays.”

SC-6 ARTICLE 3 – CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

3.2 Copies of Contract Documents:

Change the paragraph to read: “The CITY shall furnish the CONTRACTOR up to four copies of the Contract Documents. Additional copies will be furnished, upon request, at the cost of reproduction.”

SC-7 ARTICLE 6 – CONTRACTOR’S RESPONSIBILITIES

6.17 Safety and Protection; Add the following:

6.17.4 The Contractor shall do whatever work is necessary for overall project safety and be solely and completely responsible for conditions of the job site, including safety of all persons (including employees) and property during the Contract period. This requirement shall apply continuously and not limited to normal working hours.

Safety provisions shall conform to Federal and State Departments of Labor Occupational Safety and Health Act (OSHA), and other applicable federal, state, county, and local laws, ordinances, codes, requirements set forth herein, and regulations that may be specified in other parts of these Contract Documents. Where these are in conflict, the more stringent requirements shall apply. Contractor shall become thoroughly familiar with governing safety provisions and shall comply with the obligations set forth therein.

The Contractor shall develop and maintain for the duration of the Contract, a safety program that will effectively incorporate and implement required safety provisions. Contractor shall appoint a qualified employee who is authorized to supervise and enforce compliance with the safety program.

The Engineer’s duty to conduct construction review of the Contractor’s performance does not include a review or approval of the adequacy of Contractor’s safety supervisor, safety program, or safety measures taken in, on, or near the construction site.

As part of safety program, Contractor shall maintain at its office or other well-known location at the job site, safety equipment applicable to the Work as prescribed by governing safety authorities, and articles necessary for giving first aid to the injured. Establish procedures for the immediate removal to a hospital or a doctor’s care of persons who may be injured on the job site.

Contractor shall do all work necessary to protect the general public from hazards, including but not limited to, surface irregularities, trenches, excavations, and blasting. Barricades, lanterns, and proper signs shall be furnished in sufficient amount to safeguard the public and the work. Construct and maintain satisfactory and substantial fencing, railings, barricades, or steel plates, as applicable, at all openings, obstructions, or other hazards. Such barricades shall have adequate warning lights as necessary or required for safety.

CONTRACTOR shall submit a specific traffic control plan for temporary traffic routing and signage during construction. Traffic control plan shall comply with rules and regulations of the

City and state authorities regarding closing or restricting the use of public streets or highways. No public or private road shall be closed, except by written permission of the proper authority. CONTRACTOR shall assure the least possible obstruction to traffic and normal commercial pursuits.

CONTRACTOR shall notify the Department of Public Works, and Department of Public Safety before closing any street or portion thereof and notify said departments when the streets are again possible for emergency vehicles. Do not block off emergency vehicle access without written permission from the Unalaska fire department. CONTRACTOR shall conduct operations with the least interference to fire equipment access, and at no time prevent such access.

CONTRACTOR shall leave a night emergency telephone number or numbers with the police department, so that contact may be made easily at all times in case of barricade and flare trouble or other emergencies.

Add the following paragraph:

6.27 Pre-Construction Conference/Partnering Meeting:

The CONTRACTOR shall attend a Pre-construction/Partnering Meeting to review the major components and schedule, roles and lines of authority for project personnel, discuss key issues/concerns, and to establish a clear communication system between the CONTRACTOR, OWNER, and design team. The meeting will be held in Unalaska within 45 days of the NOTICE OF AWARD to the CONTRACTOR.

SC-8 ARTICLE 13 – PAYMENTS TO CONTRACTOR AND COMPLETION

13.8 Retainage:

Delete the existing paragraph and replace with the following:

“The CITY will retain a maximum amount equal to 10% of the total amount earned on all progress payments. Once 50 percent of the work is complete and if the character and progress of the work have been satisfactory to the OWNER, the OWNER may determine that, as long as the character and progress of the work remain satisfactory to them, there will be no additional retainage on account of work completed; in which case, the remaining progress payments prior to Substantial Completion will be in an amount equal to 100 percent of the work completed. All retainage shall bear interest at the rate required by AS 36.90.250.”

SC-9 ARTICLE 7 – LAWS AND REGULATIONS

Add the following paragraph.

7.19 DBE and EEO Program Requirements

The City is a recipient of an Alaska Clean Water Fund loan that has requirements for Contractor compliance with certain Disadvantaged Business Enterprises (DBE) and Equal Employment Opportunity (EEO) programs. Necessary information and forms are provided in Appendix F of

these Contract Documents. The selected Contractor will be responsible for reporting and submission of the required forms to the State of Alaska in a timely and correct manner.

SC-10 ARTICLE 4 – LAND AND PHYSICAL CONDITIONS

Add the following to Subsection 4.3 – Explorations and Reports

4.3.1 Explosives Handling

The stockpiled shotrock shown on the drawings has been identified to contain remnants from previous blasting operations at the originating site. To date, items encountered include explosive wrappers with attached blasting agent and one wrapper from a booster. It is unknown if there are intact, complete or viable explosives remaining in the stockpile. All work involving relocation and/or construction with the stockpiled materials shall be conducted under the assumption that the possibility of encountering undetonated explosives exists. Any whole explosives encountered must be reported to the U.S. Bureau of Alcohol, Tobacco and Firearms (ATF) The following conditions apply to all construction involving work associated with the stockpiled shotrock:

Option #1

In the event that undetonated explosives or explosives remnants are discovered within the stockpile, the City will provide (at no charge to the Contractor) a ATF Employee Possessor within two (2) hours of written notice from the Contractor. The ATF Employee Possessor will remove all undetonated explosives and/or explosives remnants from the stockpile in accordance with recommendations of the explosive manufacturer and all applicable state and federal requirements. The undetonated explosives and/or explosives remnants will be placed in a City-provided explosives storage magazine for disposal at a later date. The City will cover all costs associated with proper disposal of undetonated explosives or explosives remnants stored in the magazine.

Option #2

The City will provide (at no charge to the Contractor) an approved explosives storage magazine within the limits of the project in which any explosives remnants or intact explosives discovered and removed from the stockpile may be stored by the Contractor's ATF Employee Possessor* and State of Alaska Licensed Powderman*. Once stored, the Contractor must provide written notice to the City and (a) the Contractor must inform the City that it wishes to have the City dispose of the undetonated explosives or explosives remnants stored in the magazine at no charge to the Contractor or (b) the Contractor must dispose of the undetonated explosives or explosives remnants stored in the onsite magazine at no cost to the City in accordance with recommendations of the explosive manufacturer and all applicable state and federal requirements.

*Licensed Powderman is an explosive handler as defined in the Alaska Department of Labor (ADOL) - Labor Standards and Safety Division Mechanical Inspection dated February 2012 with a current Certificate of Fitness. This document is attached as an Appendix to these contract

Documents. The Licensed Powderman shall either be named as an Employee Possessor on someone else's ATF permit, or have an ATF license or permit for explosives.

*ATF Employee Possessor is an explosive handler approved by the U.S. Bureau of Alcohol, Tobacco, Firearms, and Explosives to transport, ship, receive, or possess explosive materials as an employee-possessor under a federal explosive license or permit.

ARTICLE 1 - DEFINITIONS

ARTICLE 2 - AUTHORITIES AND LIMITATIONS

- 2.1 Authorities and Limitations
- 2.2 Evaluations by Contracting Officer
- 2.3 Means and Methods
- 2.4 Visits to Site

**ARTICLE 3 - CONTRACT DOCUMENTS:
INTENT, AMENDING, REUSE**

- 3.1 Incomplete Contract Documents
- 3.2 Copies of Contract Documents
- 3.3 Scope of Work
- 3.4 Intent of Contract Documents
- 3.5 Discrepancy in Contract Documents
- 3.6 Clarifications and Interpretations
- 3.7 Reuse of Documents

**ARTICLE 4 - LANDS AND PHYSICAL CONDI-
TIONS**

- 4.1 Availability of Lands
- 4.2 Visit to Site
- 4.3 Explorations and Reports
- 4.4 Utilities
- 4.5 Damaged Utilities
- 4.6 Utilities Not Shown or Indicated
- 4.7 Survey Control

**ARTICLE 5 - BONDS AND INSURANCE
AND INDEMNIFICATION**

- 5.1 Delivery of Bonds
- 5.2 Bonds
- 5.3 Replacement of Bond and Surety
- 5.4 Insurance Requirements
- 5.5 Indemnification

**ARTICLE 6 - CONTRACTOR'S RESPONSIBILI-
TIES**

- 6.1 Supervision of Work
- 6.2 Superintendence by CONTRACTOR
- 6.3 Character of Workers
- 6.4 CONTRACTOR to Furnish
- 6.5 Materials and Equipment
- 6.6 Anticipated Schedules
- 6.7 Finalizing Schedules
- 6.8 Adjusting Schedules
- 6.9 Substitutes of "Or-Equal" Items
- 6.10 Substitute Means and Methods
- 6.11 Evaluation of Substitution
- 6.12 Dividing the Work
- 6.13 Subcontractors
- 6.14 Use of Premises

- 6.15 Structural Loading
- 6.16 Record Documents
- 6.17 Safety and Protection
- 6.18 Safety Representative
- 6.19 Emergencies
- 6.20 Shop Drawings and Samples
- 6.21 Shop Drawings and Sample Review
- 6.22 Maintenance During Construction
- 6.23 Continuing the Work
- 6.24 Consent to Assignment
- 6.25 Use of Explosives
- 6.26 CONTRACTOR's Records

ARTICLE 7 - LAWS AND REGULATIONS

- 7.1 Laws to be Observed
- 7.2 Permits, Licenses, and Taxes
- 7.3 Patented Devices, Materials and Processes
- 7.4 Compliance of Specifications and Drawings
- 7.5 Accident Prevention
- 7.6 Sanitary Provisions
- 7.7 Business Registration
- 7.8 Professional Registration and Certification
- 7.9 Local Building Codes
- 7.10 Air Quality Control
- 7.11 Archaeological or Paleontological Discoveries
- 7.12 Alaska Forest Products
- 7.13 Preferential Employment
- 7.14 Wages and Hours of Labor
- 7.15 Overtime Work Hours and Compensation
- 7.16 Covenant Against Contingent Fees
- 7.17 Officials Not to Benefit
- 7.18 Personal Liability of Public Officials

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ACKNOWLEDGMENT

The City of Unalaska, "General Conditions" are based on the "Standard General Conditions of the Construction Contract" as published by the National Society of Professional Engineers (document number 1910-8, 1983 edition) on behalf of the Engineers Joint Construction Documents Committee. Portions of the NSPE General Conditions are reprinted herein by the express permission of NSPE to the State of Alaska, which supplied these General Conditions to the City of Unalaska. Modifications to the NSPE text are made to provide for State laws, regulations, and established procedures.

The granting of permission by NSPE to allow the State of Alaska to reprint portions of the NSPE document 1910-8, 1983 does not constitute approval of the State of Alaska General Conditions or the subsequently developed City of Unalaska General Conditions.

Insurance requirements were modified March, 2001.

ARTICLE 1 - DEFINITIONS

Wherever used in the Contract Documents the following terms, or pronouns in place of them, are used, the intent and meaning, unless a different intent or meaning is clearly indicated, shall be interpreted as set forth below.

The titles and headings of the Sections, Subsections and Articles herein are intended for convenience of reference and shall not be considered as having bearing on their interpretation.

Whenever used in the Specifications or other Contract Documents the following terms have the meaning indicated which are applicable to both the singular and plural thereof. Working titles which have a masculine gender are intended to refer to persons of either sex.

Terms not defined below shall have their ordinary accepted meanings within the context in which they are used. "Webster's Third New International Dictionary of the English Language, Unabridged, Copyright 1961", or subsequent revision thereof; shall provide ordinarily accepted meanings. Words which have a well-known technical or trade meaning when used to describe work, materials or equipment shall be interpreted in accordance with such meaning. Words defined in Article 1 are capitalized throughout these General Conditions.

Addenda - All clarifications, corrections, or changes issued graphically or in writing by the CITY after the advertisement but prior to the opening of bids.

Advertisement - The public announcement, as required by law, inviting Bids for work to be performed or materials to be furnished.

Application for Payment - The form provided by the CITY which is used by the CONTRACTOR in requesting progress or final payments and which is to include such supporting documentation as is required by the Contract Documents.

Approved or Approval - Means written approval by Contracting Officer or his authorized representative as defined in Article 2.1.

A.S. - Initials which stand for Alaska Statute.

Award - The acceptance, by the City, of the successful Bid.

Bid - The offer of a bidder, on the prescribed form to perform the work at the prices quoted.

Bid Bond - A type of bid Guarantee.

Bid Guaranty - The security furnished with a bid to guarantee that the bidder will enter into a contract if his proposal is accepted by the Department.

Bidder - Any individual, firm, corporation or any acceptable combination thereof, or joint venture submitting a bid for the advertised Work.

Calendar Day - Every day shown on the calendar, beginning and ending at midnight.

Change Order - A written order by the CITY directing changes to the contract, within its general scope.

City - The City of Unalaska, Alaska. References to "owner" or "Contracting Agency" mean the city.

Conditions of the Contract - Those portions of the Contract Documents which define the rights and responsibilities of the contracting parties and of others involved in the Work. The Conditions of the Contract include General Conditions, Supplementary Conditions and other Conditions.

Contract - The written agreement between the CITY and the CONTRACTOR setting forth the obligations of the parties and covering the Work to be performed, all as required by the Contract Documents.

Contract Documents - The Contract Form, Addenda, the Bidding Requirements and CONTRACTOR's Bid (including all appropriate bid tender forms), the Bonds, the Conditions of the Contract and all other Contract Requirements, the Specifications, and the Drawings furnished by the CITY to the CONTRACTOR, together with all change orders and documents approved by the Contracting Officer for inclusion, modifications and supplements issued on or after the Effective Date of the Contract.

Contracting Officer - The Contracting Officer shall be the City of Unalaska Director of Public Works.

Contractor - The individual, firm, corporation or any acceptable combination thereof, contracting with the CITY for performance of the Work.

Contract Price - The total moneys payable by the CITY to the CONTRACTOR under the terms of the Contract Documents.

Contract Time - The number of Calendar Days or the date specified in the Construction Contract and authorized time extensions which identify how much time the CONTRACTOR is allowed to achieve Final Completion.

Consultant - A person, firm, agency or corporation retained by the CITY to prepare Contract Documents, perform construction administration services, or other Project related services.

Defective - An adjective which refers to Work that is unsatisfactory, faulty or deficient, or does not conform to the Contract Documents, or does not meet the requirements of any inspection, reference standard, test or approval referred to in the Contract Documents, or has been damaged prior to the CITY's approval of final payment.

Directive - A written communication to the CONTRACTOR from the Contracting Officer interpreting or enforcing a contract requirement or ordering commencement of an item of work.

Drawings - The drawings which show the character and scope of the Work to be performed and which have been furnished by the CITY or the CITY's Consultant and are by reference made a part of the Contract Documents.

Effective Date of the Contract - The date on which the Contract is fully executed by both CONTRACTOR and the CITY.

Final Completion - The Work (or specified part thereof) has progressed to the point that all Work is complete as determined by the Contracting Officer.

General Requirements - Sections of Division 1 of the Specifications which contain administrative and procedural requirements as well as requirements for temporary facilities which apply to Specification Divisions 2 through 16.

Holidays - The City of Unalaska recognizes the following holidays:

1. New Years Day - January 1
2. President's Day - Third Monday in February
3. Memorial Day - Last Monday in May
4. Independence Day - July 4
5. Labor Day - First Monday in September
6. Veteran's Day - November 11
7. Thanksgiving Day - Fourth Thursday in November
8. Christmas Day - December 25

If any holiday listed above falls on a Saturday, Saturday and the preceding Friday are both legal holidays. If the holiday should fall on a Sunday, Sunday and the following Monday are both legal holidays.

Install - Means to build into the Work, ready to be used in complete and operable condition and in compliance with Contract Documents.

Invitation for Bids or Invitation to Bid - A portion of the Bidding Documents soliciting bids for the Work to be performed.

Notice of Intent to Award - The written notice by the CITY to all Bidders identifying the apparent successful Bidder and establishing the CITY's intent to execute the Contract when all conditions required for execution of the Contract are met.

Notice to Proceed - A written notice to the CONTRACTOR to begin the Work and establishing the date on which the Contract Time begins.

Payment Bond - The security furnished by the CONTRACTOR and his surety to guarantee payment of the debts covered by the bond.

Performance Bond - The security furnished by the CONTRACTOR and his surety to guarantee performance and completion of the work in accordance with the contract.

Project - The total construction, of which the Work performed under the Contract Documents is the whole or a part, where such total construction may be performed by more than one prime contractor.

Project Manager - The authorized representative of the Contracting Officer who is responsible for administration of the Contract.

Proposal - The offer of a bidder, on the prescribed form to perform the work at the prices quoted.

Proposal Guaranty - The security furnished with a proposal to guarantee that the bidder will enter into a contract if his proposal is accepted by the Department.

Regulatory Requirement - Laws, rules, regulations, ordinances, codes and/or orders of the United States, State of Alaska or City of Unalaska to the extent applicable to the Work.

Shop Drawings - All drawings, diagrams, illustrations, schedules and other data which are specifically prepared by or for the CONTRACTOR to illustrate some portion of the Work and all illustrations, brochures, standard schedules, performance charts, instructions, diagrams and other information prepared by a Supplier and submitted by the CONTRACTOR to illustrate material, equipment, fabrication, or erection for some portion of the Work.

Specification - Those portions of the Contract Documents consisting of written technical descriptions of materials, equipment, construction systems, standards and workmanship as applied to the Work and certain administrative and procedural details applicable thereto.

Subcontractor - An individual, firm, or corporation to whom the CONTRACTOR sublets part of the contract.

Substantial Completion - Although not fully completed, the Work (or a specified part thereof) has progressed to the point where, in the opinion of the CITY as evidenced by the CITY's written notice, it is sufficiently complete, in accordance with the Contract Documents, so that the Work (or specified part) can be utilized for the purposes for which it is intended. The terms "Substantially Complete" and "Substantially Completed" as applied to any Work refer to Substantial Completion thereof.

Supplemental Agreement - A written agreement between the CONTRACTOR and the CITY covering work that is not within the general scope of the contract.

Surety - The corporation, partnership, or individual, other than the CONTRACTOR, executing a bond furnished by the CONTRACTOR.

Unit Price Work - Work to be paid for on the basis of unit prices.

Using Agency - The entity who will occupy or use the completed Work.

Work - Work is the act of, and the result of, performing services, furnishing labor, furnishing and incorporating materials and equipment into the Project and performing other duties and obligations, all as required by the Contract Documents. Such Work, however incremental, will culminate in the entire completed Project, or the various separately identifiable parts thereof.

ARTICLE 2 - AUTHORITIES AND LIMITATIONS

2.1 Authorities and Limitations:

- 2.1.1 The Contracting Officer alone shall have the power to bind the CITY and to exercise the rights, responsibilities, authorities and functions vested in the Contracting Officer by the Contract Documents, except that the Contracting Officer shall have the right to designate in writing authorized representatives to act for him. Wherever any provision of the Contract Documents specifies an individual or organization, whether Governmental or private, to perform any act on behalf of or in the interests of the CITY that individual or organization shall be deemed to be the Contracting Officer's authorized representative under this Contract but only to the extent so specified. The Contracting Officer may, at any time during the performance of this Contract, vest in any such authorized representatives additional power and authority to act for the Contracting Officer or designate additional representatives, specifying the extent of their authority to act for the Contracting Officer; a copy of each document vesting additional authority in or removing that authority from an authorized representative or designating an additional authorized representative shall be furnished to the CONTRACTOR. The City Council reserves the right to appoint a new Contracting Officer without affecting any of the CONTRACTOR's obligations to the CITY under this Contract.
- 2.1.2 The CONTRACTOR shall perform the Work in accordance with any written order (including but not limited to instruction, direction, interpretation or determination) issued by an authorized representative in accordance with the authorized representative's authority to act for the Contracting Officer. The CONTRACTOR assumes all the risk and consequences of performing the Work in accordance with any order (including but not limited to instruction, direction, interpretation or determination) of anyone not authorized to issue such order, and of any order not in writing.
- 2.1.3 Should the Contracting Officer or his authorized representative designate Consultant(s) to act for the CITY as provided for in Paragraph 2.1.1, the performance or nonperformance of the Consultant under such authority to act, shall not give rise to any contractual obligation or duty of the Consultant to the CONTRACTOR, any Subcontractor, any Supplier, or any other organization performing any of the Work or any Surety representing them.
- 2.1.4 The term "Contracting Officer" when used in the text of these General Conditions or other Contract Documents following this section shall also mean any duly authorized representative of the Contracting Officer when authorized in accordance with Paragraph 2.1.1.

2.2 Evaluations by Contracting Officer:

2.2.1 The Contracting Officer will decide all questions which may arise as to;

- a. Quality and acceptability of materials furnished;
- b. Quality and acceptability of Work performed;
- c. Compliance with the Schedule of Progress;
- d. Interpretation of Contract Documents;
- e. Acceptable fulfillment of the Contract on the part of the CONTRACTOR.

2.2.2 In order to avoid cumbersome terms and confusing repetition of expressions in the Contract Documents whenever the terms "as ordered", "as directed", "as required", "as approved", or terms of like effect or import are used, or the adjectives "reasonable", "suitable", "acceptable", "proper" or "satisfactory" or adjectives of like effect or import are used it shall be understood as if the expression were followed by the words "the Contracting Officer". When such terms are used to describe a requirement, direction, review or judgment of the Contracting Officer as to the Work, it is intended that such requirement, direction, review or judgment will be solely to evaluate the Work for compliance with the Contract Documents (unless there is a specific statement indicating otherwise).

2.2.3 The use of any such term or adjective shall not be effective to assign to the CITY any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or authority to undertake responsibility contrary to the provision of paragraphs 2.3 or 2.4.

2.3 Means & Methods:

The means, methods, techniques, sequences or procedures of construction, or safety precautions and the program incident thereto, and the failure to perform or furnish the Work in accordance with the Contract Documents are the sole responsibility of the CONTRACTOR.

2.4 Visits to Site:

The Contracting Officer will make visits to the site and approved remote storage sites at intervals appropriate to the various stages of construction to observe the progress and quality of the executed Work and to determine, in general, if the Work is proceeding in accordance with the Contract Documents. Such observations or the lack of such observations shall in no way relieve the CONTRACTOR from his duty to perform the Work in accordance with the Contract Documents.

ARTICLE 3 - CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

3.1 Incomplete Contract Documents:

The submission of a Bid by the Bidder is considered a representation that the Bidder examined the Contract Documents to make certain that all sheets and pages were provided and that the Bidder is satisfied as to the conditions to be encountered in performing the Work. The CITY expressly denies any responsibility or liability for a Bid submitted on the basis of an incomplete set of Contract Documents.

3.2 Copies of Contract Documents:

The CITY shall furnish to the CONTRACTOR up to ten copies of the Contract Documents. Additional copies will be furnished, upon request, at the cost of reproduction.

3.3 Scope of Work:

The Contract Documents comprise the entire Contract between the CITY and the CONTRACTOR concerning the Work. The Contract Documents are complementary; what is called for by one is as binding as if called for by all. The Contract Documents will be construed in accordance with the Regulatory Requirements.

It is specifically agreed between the parties executing this Contract that it is not intended by any of the provisions of the Contract to create in the public or any member thereof a third party benefit, or to authorize anyone not a party to this Contract to maintain a suit pursuant to the terms or provisions of the Contract.

3.4 Intent of Contract Documents:

3.4.1 It is the intent of the Contract Documents to describe a functionally complete Project to be constructed in accordance with the Contract Documents. Any Work, materials or equipment that may reasonably be inferred from the Contract Documents as being required to produce the intended result will be supplied, without any adjustment in Contract Price or Contract Time, whether or not specifically called for.

3.4.2 Reference to standard specifications, manuals or codes of any technical society, organization or association, or to the Regulatory Requirements, whether such reference be specific or by implication, shall mean the edition stated in the Contract Documents or if not stated the latest standard specification, manual, code or Regulatory Requirements in effect at the time of Advertisement for the Project (or, in the Effective Date of the Contract if there was no Advertisement). However, no provision of any referenced standard specification, manual or code (whether or not specifically incorporated by reference in the Contract Documents) shall be effective to change the duties and responsibilities of the CITY and the CONTRACTOR, or any of their consultants, agents or employees from those set forth in the Contract Documents, nor shall it be effective to assign to the CITY or any of the CITY's consultants, agents or employees, any duty or authority to supervise or direct the furnishing or

performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of paragraphs 2.3 or 2.4.

3.5 Discrepancy in Contract Documents:

3.5.1 Before undertaking the Work, the CONTRACTOR shall carefully study and compare the Contract Documents and check and verify pertinent figures, and dimensions shown thereon and all applicable field measurements. Work in the area by the CONTRACTOR shall imply verification of figures, dimensions and field measurements. If, during the above study or during the performance of the Work, the CONTRACTOR finds a conflict, error, discrepancy or omission in the Contract Document, or a discrepancy between the Contract Documents and any standard specification, manual, code, or Regulatory Requirement which affects the Work, The CONTRACTOR shall promptly report such discrepancy in writing to the Contracting Officer. The CONTRACTOR shall obtain a written interpretation or clarification from the Contracting Officer before proceeding with any Work affected thereby. Any adjustment made by the CONTRACTOR without this determination shall be at his own risk and expense. However, the CONTRACTOR shall not be liable to the CITY for failure to report any conflict, error or discrepancy in the Contract Documents unless the CONTRACTOR had actual knowledge thereof or should reasonably have knowledge thereof.

3.5.2 Discrepancy - Order of Precedence:

When conflicts, errors, or discrepancies within the Contract Documents exist, the order of precedence from most governing to least governing will be as follows:

- Supplementary Conditions
- General Conditions
- General Requirements
- Technical Specifications

Drawings (recorded dimensions will govern over scaled dimensions, large details over small scale, schedules over plans, architectural drawings over structural drawings over mechanical and electrical drawings)

3.6 Clarifications and Interpretations:

The Contracting Officer will issue with reasonable promptness such written clarifications or interpretations of the requirements of the Contract Documents as the Contracting Officer may determine necessary, which shall be consistent with or reasonably inferable from the overall intent of the Contract Documents.

3.7 Reuse of Documents:

Neither the CONTRACTOR nor any Subcontractor, or other person or organization performing or furnishing any of the Work under a direct or indirect contract with the CITY shall have or acquire any title to or ownership rights in any of the Contract Documents (or copies thereof) prepared by or for the CITY and they shall not reuse any of the Contract Documents on extensions of the Project or any other project without written consent of the Contracting Officer.

Contract Documents prepared by the CONTRACTOR in connection with the Work shall become the property of the CITY.

ARTICLE 4 - LANDS AND PHYSICAL CONDITIONS

4.1 Availability of Lands:

The CITY shall furnish as indicated in the Contract Documents, the lands upon which the Work is to be performed, rights-of-way and easements for access thereto, and such other lands which are designated for use of the CONTRACTOR in connection with the Work. Easements for permanent structures or permanent changes in existing facilities will be obtained and paid for by the CITY, unless otherwise provided in the Contract Documents. The CONTRACTOR shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

4.2 Visit to Site:

The submission of a Bid by the CONTRACTOR is considered a representation that the CONTRACTOR has visited and carefully examined the site and is satisfied as to the conditions to be encountered in performing the Work and as to the requirements of the Contract Documents.

4.3 Explorations and Reports:

The Supplementary Conditions identify reports of explorations and tests of subsurface conditions at the site that have been utilized by the CITY in preparation of the Contract Documents. The CONTRACTOR may rely upon the accuracy of the factual data contained in such reports, but not upon interpretations or opinions drawn from such factual data contained therein or for the completeness or sufficiency thereof. Except as indicated in the immediately preceding sentence and in paragraphs 4.4 and 9.9, CONTRACTOR shall have full responsibility with respect to surface and subsurface conditions at the site.

4.4 Utilities:

4.4.1 The horizontal and vertical locations of known underground utilities as shown or indicated by the Contract Documents are approximate and are based on information and data furnished to the CITY by the owners of such underground utilities.

4.4.2 The CONTRACTOR shall have full responsibility for:

- a. Reviewing and checking all information and data concerning utilities.
- b. Locating all underground utilities shown or indicated in the Contract Documents which are affected by the Work.
- c. Coordination of the Work with the owners of all utilities during construction.
- d. Safety and protection of all utilities as provided in paragraph 6.17.
- e. Repair of any damage to utilities resulting from the Work in accordance with 4.4.4 and 4.5.

4.4.3 If Work is to be performed by any utility owner, the CONTRACTOR shall cooperate with such owners to facilitate the Work.

4.4.4 In the event of interruption to any utility service as a result of accidental breakage or as a result of being exposed or unsupported, the CONTRACTOR shall promptly notify the utility owner and the Contracting Officer. If service is interrupted repair work shall be continuous until the service is restored. No Work shall be undertaken around fire hydrants until provisions for continued service have been approved by the local fire authority.

4.5 Damaged Utilities:

When utilities are damaged by the CONTRACTOR, the utility owner shall have the choice of repairing the utility or having the CONTRACTOR repair the utility. In the following circumstances, the CONTRACTOR shall reimburse the utility owner for repair costs or provide at no cost to the utility owner or the CITY, all materials, equipment and labor necessary to complete repair of the damage:

- a. When the utility is shown or indicated in the Contract Documents.
- b. When the utility has been located by the utility owner.
- c. When no locate was requested by the CONTRACTOR for utilities shown or indicated in the Contract Documents.
- d. All visible utilities.

e. When the CONTRACTOR could have, otherwise, reasonably been expected to be aware of such utility.

4.6 Utilities Not Shown or indicated.

If, while directly performing the Work, an underground utility is uncovered or revealed at the site which was not shown or indicated in the Contract Documents and which the CONTRACTOR could not reasonably have been expected to be aware of, the CONTRACTOR shall, promptly after becoming aware thereof and before performing any Work affected thereby (except in an emergency as permitted by paragraph 6.19) identify the owner of such underground facility and give written notice thereof to that owner and to the Contracting Officer. The Contracting Officer will promptly review the underground utility to determine the extent to which the Contract Documents and the Work should be modified to reflect the impacts of the discovered utility. The Contract Documents will be amended or supplemented to the extent necessary through the issuance of a change document by the Contracting Officer. During such time, the CONTRACTOR shall be responsible for the safety and protection of such underground utility as provided in paragraph 6.17. The CONTRACTOR may be allowed an increase in the Contract Price or an extension of the Contract Time, or both, to the extent that they are directly attributable to the existence of any underground utility that was not shown or indicated in the Contract Documents and which the CONTRACTOR could not reasonably have been expected to be aware of.

4.7 Survey Control:

The CITY will identify sufficient horizontal and vertical control data to enable the CONTRACTOR to survey and layout the Work. All survey work shall be performed under the direct supervision of a registered Land Surveyor when required by paragraph 7.8.

ARTICLE 5 - BONDS, INSURANCE, AND INDEMNIFICATION

5.1 Delivery of Bonds:

When the CONTRACTOR delivers the executed Contract to the Contracting Officer, the CONTRACTOR shall also deliver to the Contracting Officer such bonds as the CONTRACTOR may be required to furnish in accordance with paragraph 5.2.

5.2 Bonds:

The CONTRACTOR shall furnish Performance and Payment Bonds, each in an amount as shown on the Contract as security for the faithful performance and payment of all CONTRACTOR's obligations under the Contract Documents. These bonds shall remain in effect for one year after the date of Final Completion and until all obligations under this Contract, except special guarantees as per 12.7, have been met. All bonds shall be furnished on forms provided by the CITY (or copies thereof) and shall be executed by such Sureties as are authorized to do business in the State of Alaska. The contracting Officer may at his option copy the Surety with notice of any potential default or liability.

5.3 Replacement of Bond and Surety:

If the Surety on any bond furnished in connection with this Contract is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of paragraph 5.2, or otherwise becomes unacceptable to the CITY, or if any such Surety fails to furnish reports as to his financial condition as requested by the CITY, the CONTRACTOR shall within five days thereafter substitute another bond and Surety, both of which must be acceptable to CITY.

5.4 Insurance Requirements:

- 5.4.1. The contractor shall carry and maintain throughout the life of this contract, at its own expense, insurance not less than the amounts and coverage herein specified, and the City of Unalaska, its employees and agents shall be named as additional insured under the insurance coverage so specified and where allowed, with respect to the performance of the work. There shall be no right of subrogation against the City or its agents performing work in connection with the work, and this **waiver of subrogation** shall be endorsed upon the policies. Insurance shall be placed with companies acceptable to the City of Unalaska; and these policies providing

coverage thereunder shall contain provisions that no cancellation or material changes in the policy relative to this project shall become effective except upon **30 days** prior written notice thereof to the City of Unalaska.

- 5.4.2. Prior to commencement of the work, the contractor shall furnish certificates to the City of Unalaska, in duplicate, evidencing that the Insurance policy provisions required hereunder are in force. Acceptance by the City of Unalaska of deficient evidence does not constitute a waiver of contract requirements.
- 5.4.3. The contractor shall furnish the City of Unalaska with certified copies of policies upon request. The minimum coverages and limits required are as follows:
1. **Workers' Compensation** insurance in accordance with the statutory coverages required by the State of Alaska and **Employers Liability** insurance with limits not less than **\$1,000,000** and, where applicable, insurance in compliance with any other statutory obligations, whether State or Federal, pertaining to the compensation of injured employees assigned to the work, including but not limited to Voluntary Compensation, Federal Longshoremen and Harbor Workers Act, Maritime and the Outer Continental Shelf's Land Act.
 2. **Commercial General Liability** with limits not less than **\$1,000,000** per Occurrence and **\$2,000,000** Aggregate for Bodily Injury and Property Damage, including coverage for Premises and Operations Liability, Products and Completed Operations Liability, Contractual Liability, Broad Form Property Damage Liability and Personal Injury Liability. Coverage shall not contain any exclusion of Explosion, Collapse, or Underground. Coverage is to be endorsed to include a per project aggregate. Additionally, such insurance shall be considered primary to any other insurance carried by the City of Unalaska and the insurer will endorse the policy accordingly.
 3. **Commercial Automobile Liability** on all owned, non-owned, hired and rented vehicles with limits of liability of not less than **\$1,000,000** Combined Single Limit for Bodily Injury and Property Damage per each accident or loss.
 4. If applicable, Contractor's Equipment insurance covering all of the contractor's equipment and machinery to be used in connection with the performance of the work specified in this contract. This coverage requirement may be waived at the discretion of the City of Unalaska if the Contractor self-insures the equipment and will waive all right of recovery against the City of Unalaska in writing.
 5. **Umbrella/Excess Liability** insurance coverage of not less than **\$1,000,000** per occurrence and annual aggregate providing coverage in excess of General Liability, Auto Liability, and Employers Liability.
 6. If work involves use of aircraft, Aircraft Liability insurance covering all owned and non-owned aircraft with a per occurrence limit of not less than \$1,000,000.
 7. If work involves use of watercraft, Protection and Indemnity insurance with limits not less than \$1,000,000 per occurrence. Hull and Machinery coverage is to be carried on the vessel for the full current market value. This coverage requirement may be waived at the discretion of the City of Unalaska if the contractor self-insures the equipment and will waive all rights of recovery against the City of Unalaska in writing.
 8. Where applicable, Professional Liability insurance with limits of not less than \$1,000,000 per claim and \$1,000,000 aggregate, subject to a maximum deductible of \$10,000 per claim. The City of Unalaska has the right to negotiate increase of deductibles subject to acceptable financial information of the policyholder.
 9. Where applicable, Pollution Liability insurance with a project limit of not less than \$1,000,000 subject to a maximum deductible of \$10,000 to include coverage for Asbestos, Hazardous Materials, Lead or other related environmental hazards. The City of Unalaska has the right to negotiate increase of deductibles subject to acceptable financial information of the policyholder.

In the event Asbestos, Hazardous Materials, Lead or other related environmental hazards are transported by vehicle and/or marine vessel, the operator of such vehicles and vessels shall provide a Certificate of

Insurance for the transportation of such materials (including loading and unloading) with limits of not less than \$1,000,000.

10. **Builder's Risk Insurance:** Coverage shall be provided on an "All Risk" completed value basis and protect the interests of the City, the contractor and his subcontractors. Coverage shall include all materials, equipment and supplies that are intended for specific installation in the project while such materials, supplies and equipment are located at the project site and in transit from port of arrival to job site and while temporarily located away from the project site.
- 5.4.4. Any deductibles or self-insured retentions must be declared to and approved by the City. At the option of the City, either: the insurer shall reduce or eliminate such deductibles or self-insured retentions as respects the City, its officers, officials, employees and volunteers; or the contractor shall provide a financial guarantee satisfactory to the City guaranteeing payment of losses and related investigations, claim administration and defense expense.
- 5.4.5. All insurance policies as described above are required to be written on an "occurrence" basis. In the event occurrence coverage is not available, the contractor agrees to maintain "claims made" coverage for a minimum of two years after project completion.
- 5.4.6. If the contractor employs second tier subcontractors to perform any work hereunder, the contractor agrees to require such subcontractors to obtain, carry, maintain, and keep in force during the time in which they are engaged in performing any work hereunder, policies of insurance which comply with the requirements as set forth in this section. This requirement is applicable to subcontractors of any tier.
- 5.4.7. The contractor is required to maintain all certificates of insurance during the course of the project and for a minimum of three (3) years following the completion of such project. It is further agreed, that upon request by the City of Unalaska, the Contractor will provide copies of any and all subcontractor certificates of insurance for review of compliance.
- 5.4.8. Failure by the Contractor to maintain the required insurance coverage or to comply with the above, may, at the option of the City of Unalaska, be deemed Defective Work and remedied in accordance with the contract.
- 5.5 Indemnification:
 - 5.5.1 The CONTRACTOR and his Subcontractors will name the owner as "Additional Insured" and will provide a "Waiver of Subrogation".
 - 5.5.2 The CONTRACTOR shall indemnify, save harmless, and defend the CITY and its agents and its employees from any and all claims or actions for injuries or damages sustained by any person or property arising directly or indirectly from the construction of the CONTRACTOR's performance of this contract; however, this provision has no effect if, but only if, the sole proximate cause of the injury or damage is the negligence of the City or its agents.

ARTICLE 6 - CONTRACTOR'S RESPONSIBILITIES

6.1 Supervision of Work:

The CONTRACTOR shall supervise and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. All Work under this Contract shall be performed in a skillful and workmanlike manner. The CONTRACTOR shall be solely responsible for the means, methods, techniques, sequences and procedures of construction.

6.2 Superintendence by CONTRACTOR:

The CONTRACTOR shall keep on the Work at all times during its progress a competent resident superintendent. The Contracting Officer shall be advised in writing of the superintendent's name, local address, and telephone number. This written advice is to be kept current until Final Acceptance by the CITY. The superintendent will be the CONTRACTOR's representative at the site and shall have full authority to act and sign documents on behalf of the CONTRACTOR.

All communications given to the superintendent shall be as binding as if given to the CONTRACTOR. The CONTRACTOR shall cooperate with the Contracting Officer in every way possible.

6.3 Character of Workers:

The CONTRACTOR shall provide a sufficient number of competent, suitable qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. The CONTRACTOR shall at all times maintain good discipline and order at the site. The Contracting Officer may, in writing, require the CONTRACTOR to remove from the Work any employee the Contracting Officer deems incompetent, careless, or otherwise detrimental to the progress of the Work, but the Contracting Officer shall have no duty to exercise this right.

6.4 CONTRACTOR to Furnish:

Unless otherwise specified in the General Requirements, the CONTRACTOR shall furnish and assume full responsibility for all materials, equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities and all other facilities and incidentals necessary for the furnishing, performance, testing, start-up and completion of the Work.

6.5 Materials and Equipment:

All materials and equipment shall be of specified quality and new, except as otherwise provided in the Contract Documents. If required by the Contracting Officer, the CONTRACTOR shall furnish satisfactory evidence (including reports of required tests) as to the kind and quality of materials and equipment. All materials and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned in accordance with the instructions of the applicable Supplier except as otherwise provided in the Contract Documents; but no provision of any such instructions will be effective to assign to the CITY or any of the CITY's Consultants, agents or employees, any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of paragraphs 2.3 or 2.4.

6.6 Anticipated Schedules:

6.6.1 Within reasonable time prior to the preconstruction conference the CONTRACTOR shall submit to the Contracting Officer for review an anticipated progress schedule indicating the starting and completion dates of the various stages of the Work.

6.6.2 Within fifteen days after the date of the Notice to Proceed, the CONTRACTOR shall submit to the Contracting Officer for review:

Anticipated schedule of Shop Drawing submissions; and Anticipated Schedule of Values for all of the Work which will include quantities and prices of items aggregating the Contract Price and will subdivide the Work into component parts in sufficient detail to serve as the basis for progress payments during construction. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work which will be confirmed in writing by the CONTRACTOR at the time of submission.

6.7 Finalizing Schedules:

Prior to processing the first Application for Payment the Contracting Officer and the CONTRACTOR will finalize schedules required by paragraph 6.6.

Acceptance by the CITY of the progress schedule will neither impose on the CITY nor relieve the CONTRACTOR from full responsibility for the progress or scheduling of the Work. If accepted, the finalized schedule of Shop Drawing and other required submissions will be acceptable to the CITY as providing a workable arrangement for processing the submissions. If accepted the finalized Schedule of Values will be acceptable to the CITY as an approximation of anticipated value of Work accomplished over the anticipated Contract Time. Receipt and acceptance of a schedule submitted by the CONTRACTOR shall not be construed to assign responsibility for performance or contingencies to the CITY or relieve the CONTRACTOR of his responsibility to adjust his forces, equipment, and work schedules as may be necessary to insure completion of the Work within prescribed Contract Time. Should the progress of the Work be

discontinued for any reason, the CONTRACTOR shall notify the Contracting Officer at least 24 hours in advance of resuming operations.

6.8 Adjusting Schedules:

Upon substantial changes to the schedule or upon request, the CONTRACTOR shall submit to the Contracting Officer for acceptance (to the extent indicated in paragraph 6.7 and the General Requirements) adjustments in the schedules to reflect the actual present and anticipated progress of the Work.

6.9 Substitutes or "Or-Equal" Items:

6.9.1 Whenever materials or equipment are specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the naming of the item is intended to establish the type, function and quality required. Unless the name is followed by words indicating that no substitution is permitted, materials or equipment of other Suppliers may be accepted by the Contracting Officer only if sufficient information is submitted by the CONTRACTOR which clearly demonstrates to the Contracting Officer that the material or equipment proposed is equivalent or equal in all aspects to that named. The procedure for review by the Contracting Officer will include the following as supplemented in the General Requirements.

6.9.2 Requests for review of substitute items of material and equipment will not be accepted by the Contracting Officer from anyone other than the CONTRACTOR.

6.9.3 If the CONTRACTOR wishes to furnish or use a substitute item of material or equipment, the CONTRACTOR shall make written application to the Contracting Officer for acceptance thereof, certifying that the proposed substitute will perform adequately the functions and achieve the results called for by the general design, be similar and of equal substance to that specified and be suited to the same use as that specified. The application will state that the evaluation and acceptance of the proposed substitute will not delay the CONTRACTOR's achievement of Substantial Completion on time, whether or not acceptance of the substitute for use in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with the CITY for work on the Project) to adapt the design to the proposed substitute and whether or not incorporation or use of the substitute in connection with the Work is subject to payment of any license fee or royalty.

6.9.4 All variations of the proposed substitute from that specified will be identified in the application and available maintenance, repair and replacement service will be indicated. The application will also contain an itemized estimate of all costs that will result directly or indirectly from acceptance of such substitute, including costs of redesign and claims of other contractors affected by the resulting change, all of which shall be considered by the Contracting Officer in evaluating the proposed substitute. The Contracting Officer may require the CONTRACTOR to furnish at the CONTRACTOR's expense additional data about the proposed substitute. The Contracting Officer may reject any substitution request which the Contracting Officer determines is not in the best interest of the CITY.

6.10 Substitute Means and Methods:

If a specific means, method, technique, sequence or procedure of construction is indicated in or required by the Contract Documents, the CONTRACTOR may furnish or utilize a substitute means, method, sequence, technique or procedure of construction acceptable to the Contracting Officer, if the CONTRACTOR submits sufficient information to allow the Contracting Officer to determine that the substitute proposed is equivalent to that indicated or required by the Contract Documents. The procedure for review by the Contracting Officer will be similar to that provided in paragraph 6.9 as applied by the Contracting Officer and as may be supplemented in the General Requirements.

6.11 Evaluation of Substitution:

The Contracting Officer will be allowed a reasonable time within which to evaluate each proposed substitute. The Contracting Officer will be the sole judge of acceptability, and no substitute will be ordered, installed or utilized without the Contracting Officer's prior written acceptance which will be evidenced by either a Change Order or a Shop Drawing

approved in accordance with Sections 6.20 and 6.21. The Contracting Officer may require the CONTRACTOR to furnish at the CONTRACTOR's expense a special performance guarantee or other surety with respect to any substitute.

6.12 Dividing the Work:

The divisions and sections of the Specifications and the identifications of any Drawings shall not control the CONTRACTOR in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

6.13 Subcontractors:

The CONTRACTOR may utilize the services of licensed specialty Subcontractors on those parts of the Work which, under normal contracting practices, are performed by licensed specialty Subcontractors, in accordance with the following conditions:

- 6.13.1 The CONTRACTOR shall not award any Work to any Subcontractor without prior written approval of the Contracting Officer. This approval will not be given until the CONTRACTOR submits to the Contracting Officer a written statement concerning the proposed award to the Subcontractor which shall contain required E.E.O. documents, evidence of insurance, and a copy of the proposed subcontract executed by the subcontractor. No acceptance by the Contracting Officer of any such Subcontractor shall constitute a waiver of any right of the CITY to reject Defective Work.
- 6.13.2 The CONTRACTOR shall be fully responsible to the CITY for all acts and omissions of the Subcontractors, Suppliers and other persons and organizations performing or furnishing any of the Work under a direct or indirect contract with CONTRACTOR just as CONTRACTOR is responsible for CONTRACTOR's own acts and omissions.
- 6.13.3 All Work performed for CONTRACTOR by a Subcontractor will be pursuant to an appropriate written agreement between CONTRACTOR and the Subcontractor which specifically binds the Subcontractor to the applicable terms and conditions of the Contract Documents for the benefit of the CITY and contains waiver provisions as required by paragraph 13.17 and termination provisions as required by Article 14.
- 6.13.4 Nothing in the Contract Documents shall create any contractual relationship between the CITY and any such Subcontractor, Supplier or other person or organization, nor shall it create any obligation on the part of the CITY to pay or to see to the payment of any moneys due any such Subcontractor, Supplier or other person or organization except as may otherwise be required by Regulatory Requirements. The CITY will not undertake to settle any differences between or among the CONTRACTOR, Subcontractors, or Suppliers.
- 6.13.5 The CONTRACTOR and Subcontractors shall coordinate their work and facilitate general progress of Work. Each trade shall afford other trades every reasonable opportunity for installation of their work and storage of materials. If cooperative work of one trade must be altered due to lack of proper supervision, or failure to make proper provisions in time by another trade, such conditions shall be remedied by the CONTRACTOR with no change in Contract Price or Contract Time.
- 6.13.6 The CONTRACTOR shall include on his own payrolls any person or persons working on the contract who are not covered by written subcontract, and shall ensure that all Subcontractors include on their payrolls all persons performing work under the direction of the Subcontractor.

6.14 Use of Premises:

The CONTRACTOR shall confine construction equipment, the storage of materials and equipment and the operations of workers to the Project limits and approved remote storage sites and lands and areas identified in and permitted by Regulatory Requirements, rights-of-way, permits and easements, and shall not unreasonably encumber the premises with construction equipment or other materials or equipment. The CONTRACTOR shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof or of any land or areas contiguous thereto, resulting from the performance of the Work. Should any claim be made against the CITY by any such owner or occupant because of the performance of the Work, the CONTRACTOR shall hold the CITY and its agencies harmless.

6.15 Structural Loading:

The CONTRACTOR shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall the CONTRACTOR subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

6.16 Record Documents:

The CONTRACTOR shall maintain in a safe place at the site one record copy of all Drawings, Specifications, Addenda, Field Memos, Work Orders, Change Orders, Supplemental Agreements, and written interpretations and clarifications (issued pursuant to paragraph 3.6) in good order and annotated to show all changes made during construction. These record documents together with all approved samples and a counterpart of all approved Shop Drawings will be available to the Contracting Officer for reference and copying. Upon completion of the Work, the annotated record documents, samples and Shop Drawings will be delivered to the Contracting Officer. Record documents shall accurately record variations in the Work which vary from requirements shown or indicated in the Contract Documents.

6.17 Safety and Protection:

The CONTRACTOR alone shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. The CONTRACTOR shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

- 6.17.1 All employees on the Work and other persons and organizations who may be affected thereby;
- 6.17.2 All the Work and materials and equipment to be incorporated therein, whether in storage on or off the site; and
- 6.17.3 Other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation or replacement in the course of construction.

The CONTRACTOR shall comply with all applicable Regulatory Requirements of any public body having jurisdiction for the safety of persons or property or to protect them from damage, injury or loss; and shall erect and maintain all necessary safeguards for such safety and protection. The CONTRACTOR shall notify owners of adjacent property and utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation and replacement of their property. All damage, injury or loss to any property caused, directly or indirectly, in whole or in part, by the Contractor, any Subcontractor, Supplier or any other person or organization directly or indirectly employed by any of them to perform or furnish any of the Work or anyone for whose acts any of them may be liable, shall be remedied by the CONTRACTOR with no change in Contract Price or Contract Time except as stated in 4.6, except damage or loss attributable to unforeseeable causes beyond the control of and without the fault or negligence of the CONTRACTOR, including but not restricted to acts of God, or the public enemy or governmental authorities. The CONTRACTOR's duties and responsibilities for the safety and protection of the Work shall continue until Final Acceptance (except as otherwise expressly provided in connection with Substantial Completion).

6.18 Safety Representative:

The CONTRACTOR shall designate a responsible safety representative at the site. This person shall be the CONTRACTOR's superintendent unless otherwise designated in writing by the CONTRACTOR to the Contracting Officer.

6.19 Emergencies:

In emergencies affecting the safety or protection of persons or the Work or property at the site or adjacent thereto, the CONTRACTOR, without special instruction or authorization from the CITY, is obligated to act to prevent threatened damage, injury or loss. The CONTRACTOR shall give the Contracting Officer prompt written notice if the CONTRACTOR believes that any significant changes in the Work or variations from the Contract Documents is required because of the action taken in response to an emergency, a change will be authorized by one of the methods indicated in Paragraph 9.2, as determined appropriate by the Contracting Officer.

6.20 Shop Drawings and Samples:

- 6.20.1 After checking and verifying all field measurements and after complying with applicable procedures specified in the General Requirements, the CONTRACTOR shall submit to the Contracting Officer for review and approval in accordance with the accepted schedule of Shop Drawing submissions the required number of all Shop Drawings, which will bear a stamp or specific written indication that the CONTRACTOR has satisfied CONTRACTOR's responsibilities under the Contract Documents with respect to the review of the submission. All submissions will be identified as the Contracting Officer may require. The data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials and similar data to enable the Contracting Officer to review the information as required.
- 6.20.2 The CONTRACTOR shall also submit to the Contracting Officer for review an approval with such promptness as to cause no delay in Work, all samples required by the Contract Documents. All samples will have been checked by and accompanied by a specific written indication that the CONTRACTOR has satisfied CONTRACTOR's responsibilities under the Contract Documents with respect to the review of the submission and will be identified clearly as to material, Supplier, pertinent data such as catalog numbers and the use for which intended.
- 6.20.3 Before submission of each Shop Drawing or sample the CONTRACTOR shall have determined and verified all quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers and similar data with respect thereto and reviewed or coordinated each Shop Drawing or sample with other Shop Drawings and samples and with the requirements of the Work and the Contract Documents.
- 6.20.4 At the time of each submission the CONTRACTOR shall give the Contracting Officer specific written notice of each variation that the Shop Drawings or samples may have from the requirements of the Contract Documents, and, in addition, shall cause a specific notation to be made on each Shop Drawing submitted to the Contracting Officer for review and approval of each such variation. All variations of the proposed shop drawing from that specified will be identified in the submission and available maintenance, repair and replacement service will be indicated. The submittal will also contain an itemized estimate of all costs that will result directly or indirectly from acceptance of such variation, including costs of redesign and claims of other contractors affected by the resulting change, all of which shall be considered by the CITY in evaluating the proposed variation. If the variation may result in a change of Contract Time or Price, or contract responsibility, and is not minor in nature; the CONTRACTOR must submit a written request for Change Order with the variation to notify the CITY of his intent. The CITY may require the CONTRACTOR to furnish at the CONTRACTOR's expense additional data about the proposed variation. The Contracting Officer may reject any variation request which the Contracting Officer determines is not in the best interest of the CITY.

6.21 Shop Drawing and Sample Review:

- 6.21.1 The Contracting Officer will review with reasonable promptness Shop Drawings and samples, but the Contracting Officer's review will be only for conformance with the design concept of the Project and for compliance with the information given in the Contract Documents and shall not extend to means, methods, techniques, sequences or procedures of construction (except where a specific means, method, technique, sequence or procedure of construction is indicated in or required by the Contract Documents) or to safety precautions or programs incident thereto. The review of a separate item as such will not indicate acceptance of the assembly in which the item functions. The CONTRACTOR shall make corrections required by the Contracting Officer and shall return the required number of corrected copies of Shop Drawings and submit as required new samples for review. The CONTRACTOR shall direct specific attention in writing to revisions other than the corrections called for by the Contracting Officer on previous submittals.
- 6.21.2 The Contracting Officer's review of Shop Drawings or samples shall not relieve CONTRACTOR from responsibility for any variation from the requirements of the Contract Documents unless the CONTRACTOR has in writing advised the Contracting Officer of each such variation at the time of submission as required by paragraph 6.20.4. The Contracting Officer if he so determines, may give written approval of each such variation by Change Order, except that, if the variation is minor and no Change Order has been requested a specific written notation thereof incorporated in or accompanying the Shop Drawing or sample review comments shall suffice as a modification. No approval by the Contracting Officer will relieve the

CONTRACTOR from responsibility for errors or omissions in the Shop Drawings or from responsibility for having complied with the provisions of paragraph 6.20.3.

- 6.21.3 Where a Shop Drawing or sample is required by the Specifications, any related Work performed prior to the Contracting Officer's review of the pertinent submission will be the sole expense and responsibility of the CONTRACTOR.

6.22 Maintenance During Construction:

The CONTRACTOR shall maintain the Work during construction and until Substantial Completion, at which time the responsibility for maintenance shall be established in accordance with paragraph 13.10.

6.23 Continuing the Work:

The CONTRACTOR shall carry on the Work and adhere to the progress schedule during all disputes or disagreements with the CITY. No work shall be delayed or postponed pending resolution of any disputes, disagreements, or claims except as the CONTRACTOR and the Contracting Officer may otherwise agree in writing.

6.24 Consent to Assignment:

The CONTRACTOR shall obtain the prior written consent of the Contracting Officer to any proposed assignment of any interest in, or part of this Contract. The consent to any assignment or transfer shall not operate to relieve the CONTRACTOR or his Sureties of any of his or its obligations under this Contract or the Performance Bonds. Nothing herein contained shall be construed to hinder, prevent, or affect an assignment of monies due, or to become due hereunder, made for the benefit of the CONTRACTOR's creditors pursuant to law.

6.25 Use of Explosives:

- 6.25.1 When the use of explosives is necessary for the prosecution of the Work, the CONTRACTOR shall exercise the utmost care not to endanger life or property, including new Work and shall follow all Regulatory Requirements applicable to the use of explosives. The CONTRACTOR shall be responsible for all damage resulting from the use of explosives.
- 6.25.2 All explosives shall be stored in a secure manner in compliance with all Regulatory Requirements, and all such storage places shall be clearly marked. Where no Regulatory Requirements apply, safe storage shall be provided not closer than 1,000 feet from any building, camping area, or place of human occupancy.
- 6.25.3 The CONTRACTOR shall notify each public utility owner having structures in proximity to the site of his intention to use explosives. Such notice shall be given sufficiently in advance to enable utility owners to take such steps as they may deem necessary to protect their property from injury. However, the CONTRACTOR shall be responsible for all damage resulting from the use of the explosives, whether or not, utility owners act to protect their property.

6.26 CONTRACTOR's Records:

- 6.26.1 Records of CONTRACTOR and Subcontractors relating to personnel, payrolls, invoices of materials, and any and all other data relevant to the performance of the Contract, must be kept on a generally recognized accounting system. Such records must be available during normal work hours to the Contracting Officer for purposes of investigation to ascertain compliance with Regulatory Requirements and provision of the Contract Documents.
- 6.26.2 Payroll records must contain the name and address of each employee, his correct classification, rate of pay, daily and weekly number of hours of work, deductions made, and actual wages paid. The CONTRACTOR and Subcontractors shall make employment records available for inspection by the Contracting Officer and representatives of the U.S. and/or State Department of Labor and will permit such representatives to interview employees during working hours on the Project.

- 6.26.3 Records of all communications between the CITY and the CONTRACTOR and other parties, where such communications affected performance of this Contract, must be kept by the CONTRACTOR and maintained for a period of three years from Final Acceptance. The CITY or its assigned representative may perform an audit of these records during normal work hours after written notice to the CONTRACTOR.

ARTICLE 7 - LAWS AND REGULATIONS

7.1 Laws to be Observed:

The CONTRACTOR shall keep fully informed of all Federal and State Regulatory Requirements and all orders and decrees of bodies or tribunals having any jurisdiction or authority, which in any manner affect those engaged or employed on the Work, or which in any way affect the conduct of the Work. The CONTRACTOR shall at all times observe and comply with all such Regulatory Requirements, orders and decrees; and shall protect and indemnify the CITY and its representatives against claim or liability arising from or based on the violation of any such Regulatory Requirement, order, or decree whether by the CONTRACTOR, Subcontractor, or any employee of either. Except where otherwise expressly required by applicable Regulatory Requirements, the CITY shall not be responsible for monitoring CONTRACTOR's compliance with any Regulatory Requirements.

7.2 Permits, Licenses, and Taxes:

- 7.2.1 The CONTRACTOR shall procure all permits and licenses, pay all charges, fees and taxes, and give all notices necessary and incidental to the due and lawful prosecution of the Work. As a condition of performance of this Contract, the CONTRACTOR shall pay all Federal, State and local taxes incurred by the CONTRACTOR, in the performance of the Contract. Proof of payment of these taxes is a condition precedent to final payment by the CITY under this Contract.
- 7.2.2 The CONTRACTOR's certification that taxes have been paid (as contained in the Release of Contract) will be verified with the Department of Revenue and Department of Labor, prior to final payment.
- 7.2.3 If any Federal, State or local tax is imposed, charged, or repealed after the date of Bid opening and is made applicable to and paid by the CONTRACTOR on the articles or supplies herein contracted for, then the Contract shall be increased or decreased accordingly by a Change Order.

7.3 Patented Devices, Materials and Processes:

If the CONTRACTOR employs any design, device, material, or process covered by letters of patent, trademark or copyright, the CONTRACTOR shall provide for such use by suitable legal agreement with the patentee or owner. The CONTRACTOR and the Surety shall indemnify and save harmless the CITY and its agents, any affected third party, or political subdivision from any and all claims for infringement by reason of the use of any such patented design, device, material or process, or any trademark or copyright, and shall indemnify the CITY for any costs, expenses, and damages which it may be obliged to pay by reason of any infringement, at any time during the prosecution or after the completion of the Work.

7.4 Compliance of Specifications and Drawings:

If the CONTRACTOR observes that the Specifications and Drawings supplied by the CITY are at variance with any Regulatory Requirements, CONTRACTOR shall give the Contracting Officer prompt written notice thereof, and any necessary changes will be authorized by one of the methods indicated in paragraph 9.2. as determined appropriate by the Contracting Officer. If the CONTRACTOR performs any Work knowing or having reason to know that it is contrary to such Regulatory Requirements, and without such notice to the Contracting Officer, the CONTRACTOR shall bear all costs arising therefrom; however, it shall not be the CONTRACTOR's primary responsibility to make certain that the Specifications and Drawings supplied by the CITY are in accordance with such Regulatory Requirements.

7.5 Accident Prevention:

The CONTRACTOR shall comply with AS 18.60.075 and all pertinent provisions of the Construction Code Occupational Safety and Health Standards issued by the Alaska Department of Labor.

7.6 Sanitary Provisions:

The CONTRACTOR shall provide and maintain in a neat and sanitary condition such accommodations for the use of his employees and CITY representatives as may be necessary to comply with the requirements of the State and local Boards of Health, or of other bodies or tribunals having jurisdiction.

7.7 Business Registration:

Comply with AS 08.18.011, as follows: "it is unlawful for a person to submit a bid or work as a contractor until he has been issued a certificate of registration by the Department of Commerce. A partnership or joint venture shall be considered registered if one of the general partners or ventures whose name appears in the name under which the partnership or venture does business is registered."

7.8 Professional Registration and Certification:

All craft trades, architects, engineers and land surveyors, electrical administrators, explosive handlers, and welders employed under the Contract shall specifically comply with applicable provisions of AS 08.18, 08.48, 08.40, 08.52, and 08.99. Provide copies of individual licenses within seven days following a request from the Contracting Officer.

7.9 Local Building Codes:

The CONTRACTOR shall comply with AS 35.10.025 which requires construction in accordance with applicable local building codes including the obtaining of required permits.

7.10 Air Quality Control:

The CONTRACTOR shall comply with all applicable provision of AS 46.03.04 as pertains to Air Pollution Control.

7.11 Archaeological or Paleontological Discoveries:

When the CONTRACTOR's operation encounters prehistoric artifacts, burials, remains of dwelling sites, or paleontological remains, such as shell heaps, land or sea mammal bones or tusks, the CONTRACTOR shall cease operations immediately and notify the Contracting Officer. No artifacts or specimens shall be further disturbed or removed from the ground and no further operations shall be performed at the site until so directed. Should the Contracting Officer order suspension of the CONTRACTOR's operations in order to protect an archaeological or historical finding, or order the CONTRACTOR to perform extra work, such shall be covered by an appropriate Contract change document.

7.12 Alaska Forest Products:

Pursuant to AS 36.15.010, timber, lumber, and manufactured lumber products originating from local forests shall be used, whenever practicable or specified.

7.13 Preferential Employment:

The CONTRACTOR shall comply with AS 36.10, as amended, which provides for preferential employment of Alaska residents.

7.14 Wages and Hours of Labor:

- 7.14.1 One certified copy of all payrolls shall be submitted weekly to the State Department of Labor to assure compliance with AS 36.05.040, Filing Schedule of Employees Wages Paid and Other Information. The prime CONTRACTOR shall be responsible for the submission of certified copies of payrolls of all Subcontractors. The certification shall affirm that the payrolls are current and complete, that the wage rates contained therein are not less than the applicable rates referenced in these Contract Documents, and that the classification set forth for each laborer or mechanic conforms with the work he performed. The CONTRACTOR and his Subcontractors shall attend all hearings and conferences and produce such books, papers, and documents all as requested by the Department of Labor. Should Federal funds be involved, the Contracting Agency shall also receive a copy of the CONTRACTOR's certified payrolls.

7.14.2 The following Labor provisions shall also apply to this Contract:

- a. The CONTRACTOR and his Subcontractors shall pay all employees unconditionally and not less than once a week;
- b. Wages may not be less than those stated in the advertised specifications, regardless of the contractual relationship between the CONTRACTOR or Subcontractors and laborers, mechanics, or field surveyors;
- c. The scale of wages to be paid shall be posted by the CONTRACTOR in a prominent and easily accessible place at the site of the work;
- d. The CITY shall withhold so much of the accrued payments as is necessary to pay laborers, mechanics, or field surveyors employed by the CONTRACTOR or Subcontractors the difference between
 1. the rates of wages required by the contract to be paid laborers, mechanics, or field surveyors on the work, and
 2. the rates of wages in fact received by laborers, mechanics or field surveyors.

7.15 Overtime Work Hours and Compensation:

Pursuant to 40 U.S.C. 327-330 and AS 23.10.060, the CONTRACTOR shall not require nor permit any laborer or mechanic in any workweek in which he is employed on any work under this Contract to work in excess of eight hours in any Calendar Day or in excess of forty hours in such workweek on work subject to the provisions of the Contract Work Hours and Safety Standards Act unless such laborer or mechanic receives compensation at a rate not less than one and one half times his basic rate of pay for all such hours worked in excess of eight hours in any Calendar Day or in excess of forty hours in such workweek whichever is the greater number of overtime hours. In the event of any violation of this provision, the CONTRACTOR shall be liable to any affected employee for any amounts due and penalties and to the CITY for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic employed in violation of this provision in the sum of \$10.00 for each Calendar Day on which such employee was required or permitted to be employed on such work in excess of eight hours or in excess of the standard workweek of forty hours without payment of the overtime wages required by this paragraph.

7.16 Covenant Against Contingent Fees:

The CONTRACTOR warrants that no person or selling agent has been employed or retained to solicit or secure this Contract upon an agreement or understanding for a commission, percentage, brokerage, or contingent fee, excepting bona fide employees or bona fide established commercial or selling agencies maintained by the CONTRACTOR for the purpose of securing business. For breach or violation of this warrant, the CITY shall have the right to annul this Contract without liability or, in its discretion, to deduct price of consideration from the Contract or otherwise recover the full amount of such commission, percentage, brokerage, or contingent fee.

7.17 Officials Not to Benefit:

No member of or delegate to the U.S. Congress, the State Legislature, Unalaska City Council or other State or City Officials shall be admitted to any share or part of this Contract, nor to any benefit that may arise there from. However, this provision shall not be construed to extend to this Contract if made with a corporation for its general benefits.

7.18 Personal Liability of Public Officials:

In carrying out any of the provisions thereof, or in exercising any power or authority granted to the Contracting Officer by the Contract, there will be no liability upon the City nor upon its agents or authorized as its representatives, either personally or as officials of the State of Alaska, it being always understood that in such matters they act as agents and representatives of the CITY.

ARTICLE 8 - OTHER WORK

8.1 Related Work at Site:

- 8.1.1 The CITY reserves the right at any time to contract for and perform other or additional work on or near the Work covered by the Contract.
- 8.1.2 When separate contracts are let within the limits of the Project, the CONTRACTOR shall conduct his Work so as not to interfere with or hinder the work being performed by other contractors. The CONTRACTOR shall join his work with that of the others in an acceptable manner and shall perform it in proper sequence to that of others.
- 8.1.3 If the fact that other such work to be performed is identified or shown in the Contract Documents, the CONTRACTOR shall assume all liability, financial or otherwise, in connection with this Contract and indemnify and save harmless the City of Unalaska and its agents from any and all damages or claims that may arise because of inconvenience, delay, or loss experienced by the CONTRACTOR because of the presence and operations of other contractors.
- 8.1.4 If the fact that such other work to be performed was not identified or shown in the Contract Documents, written notice thereof will be given to the CONTRACTOR prior to starting any such other work. If the CONTRACTOR believes that such performance will require an increase in Contract Price or Contract Time, the CONTRACTOR shall notify the Contracting Officer of such required increase within fifteen (15) calendar days following receipt of the Contracting Officer's notice. Should the Contracting Officer find such increase(s) to be justified, a Change Order will be executed.

8.2 Access, Cutting, and Patching:

The CONTRACTOR shall afford each utility owner and any other contractor who is a party to such a direct contract with the CITY (or the CITY, if the CITY is performing the additional work with the CITY's employees) proper and safe access to the site and a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such work and shall properly connect and coordinate the Work with the work of others. The CONTRACTOR shall do all cutting, fitting and patching of the Work that may be required to make its several parts come together properly and integrate with such other work, the CONTRACTOR shall not endanger any work of others by cutting, excavating or otherwise altering their work and will only cut or alter such other work with the written consent of the Contracting Officer. The duties and responsibilities of the CONTRACTOR under this paragraph are for the benefit of other contractors to the extent that there are comparable provisions for the benefit of the CONTRACTOR in said direct contracts between the CITY and other contractors.

8.3 Defective Work by Others:

If any part of the CONTRACTOR's Work depends for proper execution or results upon the work of any such other contractor, utility owner, or the CITY, the CONTRACTOR shall inspect and promptly report to the Contracting Officer in writing any delays, defects or deficiencies in such work that render it unavailable or unsuitable for such proper execution and results. The CONTRACTOR's failure to so report will constitute an acceptance of the other work as fit and proper for integration with CONTRACTOR's Work except for latent or non apparent defects and deficiencies in the other work.

8.4 Coordination:

If the CITY contracts with others for the performance of other work at the site, Contracting Officer will have authority and responsibility for coordination of the activities among the various prime contractors.

ARTICLE 9 - CHANGES

9.1 CITY's Right to Change:

Without invalidating the Contract and without notice to any Surety, the CITY may, at any time or from time to time, order additions, deletions or revisions in the Work within the general scope of the Contract, including but not limited to changes:

- 9.1.1 In the Contract Documents;
- 9.1.2 In the method or manner of performance of the Work;
- 9.1.3 In City-furnished facilities, equipment, materials, services, or site;
- 9.1.4 Directing acceleration in the performance of the Work.

9.2 Authorization of Changes within the General Scope:

Additions, deletions, or revisions in the Work within the general scope of the Contract as specified in 9.1 shall be authorized by one or more of the following ways:

- 9.2.1 Directive (pursuant to paragraph 9.3)
- 9.2.2 A Change Order (pursuant to paragraph 9.5)
- 9.2.3 CITY's acceptance of Shop Drawing variations from the Contract Documents as specifically identified by the CONTRACTOR as required by paragraph 6.20.4.

9.3 Directives:

- 9.3.1 The Contracting Officer shall provide written clarification or interpretation of the contract documents (pursuant to paragraph 3.6).
- 9.3.2 The Contracting Officer may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Time and are consistent with the overall intent of the Contract Documents.
- 9.3.3 The Contracting Officer may order the Contractor to correct Defective Work or methods which are not in conformance with the Contract Documents.
- 9.3.4 The Contracting Officer may direct the commencement or suspension of Work or emergency related work (as provided in paragraph 6.19).
- 9.3.5 Upon the issuance of a Directive to the CONTRACTOR by the Contracting Officer, the CONTRACTOR shall immediately proceed with the performance of the work as prescribed by such Directive.
- 9.3.6 If the CONTRACTOR believes that the changes noted in a Directive may cause an increase in the Contract Price or an extension of Contract Time, the CONTRACTOR shall immediately provide written notice to the Contracting Officer depicting such increases before proceeding with the Directive, except in the case of an emergency. If the Contracting Officer finds the increase in Contract Price or the extension of Contract Time justified, a Change Order will be issued. If however, the Contracting Officer does not find that a Change Order is justified, the Contracting Officer may direct the CONTRACTOR to proceed with the work. The CONTRACTOR shall cooperate with the Contracting Officer in keeping complete daily records of the cost of such work. If a Change Order is ultimately determined to be justified, in the absence of agreed prices and unit prices, payment for such work will be made on a cost of the work basis as provided in 10.4.

9.4 Change Order:

A change in Contract Time, Contract Price, or responsibility may be made for changes within the scope of the Work only by Change Order. Upon receipt of an executed Change Order, the CONTRACTOR shall promptly proceed with the work involved which will be performed under the applicable conditions of the Contract Documents except as otherwise specifically provided. Changes in Contract Price and Contract Time shall be made in accordance with Article 10 and 11.

9.5 Shop Drawing Variations:

Variations by shop drawings shall only be eligible for consideration under 9.4 when the conditions affecting the price, time, or responsibility are identified by the CONTRACTOR in writing and a request for a Change Order is submitted as per 6.20.4.

9.6 Changes Outside the General Scope; Supplemental Agreement:

Any change which is outside the general scope of the Contract, as determined by the Contracting Officer, must be authorized by the appropriate representatives of the CITY and the CONTRACTOR.

9.7 Unauthorized Work:

The CONTRACTOR shall not be entitled to an increase in the Contract Price or an extension of the Contract Time with respect to any work performed that is not required by the Contract Documents as amended, modified and supplemented as provided in this Article 9, except in the case of an emergency as provided in paragraph 6.19 and except in the case of uncovering Work as provided in paragraph 12.4.2.

9.8 Notification of Surety:

If notice of any change affecting the general scope of the Work or the provisions of the Contract Documents including, but not limited to, Contract Price or Contract Time is required by the provisions of any Bond to be given to a Surety, the giving of any such notice will be the CONTRACTOR's responsibility, and the amount of each applicable Bond will be adjusted accordingly.

9.9 Differing Site Conditions:

9.9.1 The CONTRACTOR shall promptly, and before such conditions are disturbed (except in an emergency as permitted by paragraph 6.19), notify the Contracting Officer in writing of: (1) subsurface or latent physical conditions at the site differing materially from those indicated in the Contract, and which could not have been discovered by a careful examination of the site, or (2) unknown physical conditions at the site, or an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in this Contract. The Contracting Officer shall promptly investigate the conditions, and if the Contracting Officer finds that such conditions do materially so differ and cause an increase or decrease in the CONTRACTOR's cost of, or time required for, performance of this Contract, an equitable adjustment shall be made and the Contract modified in writing accordingly.

9.9.2 Any claim for additional compensation by the CONTRACTOR under this clause shall be made in accordance with Article 15 and shall not be allowed unless the CONTRACTOR has first given the notice required by this Contract. In the event that the Contracting Officer and the CONTRACTOR are unable to reach an agreement concerning an alleged differing site condition, the CONTRACTOR will be required to keep an accurate and detailed record which will indicate the actual cost of the work done under the alleged differing site condition. Failure to keep such a record shall be a bar to any recovery by reason of such alleged differing site conditions. The Contracting Officer shall be given the opportunity to supervise and check the keeping of such records.

ARTICLE 10 - CONTRACT PRICE; COMPUTATION AND CHANGE

10.1 Contract Price:

The Contract Price constitutes the total compensation (subject to authorized adjustments) payable to the CONTRACTOR for performing the Work. All duties, responsibilities and obligations assigned to or undertaken by the CONTRACTOR shall be at his expense without change in the Contract Price. The Contract Price may only be changed by a Change Order or Supplemental Agreement.

10.2 Claim for Price Change:

Any claim for an increase or decrease in the Contract Price shall be submitted in accordance with the terms of Article 15, and shall not be allowed unless notice requirements of this Contract have been met.

10.3 Change Order Price Determination:

The value of any work covered by a Change Order for an increase or decrease in the Contract Price shall be determined in one of the following ways:

- 10.3.1 Where the work involved is covered by unit prices contained in the Contract Documents, by application of unit prices to the quantities of the items involved (subject to the provisions of paragraphs 10.9.1
- 10.3.2 By mutual acceptance of a lump sum price which includes overhead and profit.
- 10.3.3 When 10.3.1 and 10.3.2 are inapplicable, on the basis of the Cost of the Work (determined as provided in paragraphs 10.4 and 10.5) plus a CONTRACTORS's fee for overhead and profit (determined as provided in paragraph 10.6).

10.4 Cost of the Work:

The term Cost of the Work means the sum of all costs necessarily incurred and paid by the CONTRACTOR in the proper performance of the work. Except as otherwise may be agreed to in writing by the CITY, such costs shall be in amount no higher than those prevailing in the locality of the Project, shall include only the following items and shall not include any of the costs itemized in paragraph 10.5:

- 10.4.1 Payroll costs for employees in the direct employ of the CONTRACTOR in the performance of the work under schedules of job classifications agreed upon by the CITY and the CONTRACTOR. Payroll costs for employees not employed full time on the work shall be apportioned on the basis of their time spent on the work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits which shall include social security contributions, unemployment, excise and payroll taxes, workers' or workmen's compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. Such employees shall include superintendents and foremen at the site. The expenses of performing work after regular working hours, on Saturday, Sunday or legal holidays, shall be included in the above to the extent authorized by the CITY.
- 10.4.2 Cost of all materials and equipment furnished and incorporated in the work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to the CONTRACTOR unless the CITY deposits funds with the CONTRACTOR with which to make payments, in which case the cash discounts shall accrue to the CITY. All trade discounts, rebates and refunds and all returns from sale of surplus materials and equipment shall accrue to the CITY, and the CONTRACTOR shall make provisions so that they may be obtained.
- 10.4.3 Payments made by the CONTRACTOR to Subcontractors for work performed by Subcontractors. If required by the CITY, CONTRACTOR shall obtain competitive quotes from Subcontractors or Suppliers acceptable to the CONTRACTOR and shall deliver such quotes to the CITY who will then determine which quotes will be accepted. If a subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work Plus a Fee, the Subcontractor's Cost of the Work shall be determined in the same manner as the CONTRACTOR's Cost of Work. All subcontracts shall be subject to the other provisions of the Contract Documents insofar as applicable.
- 10.4.4 Costs of special consultants (including but not limited to engineers, architects, testing laboratories, and surveyors) employed for services necessary for the completion of the work.
- 10.4.5 Supplemental costs including the following:
 - a. The proportion of necessary transportation, travel and subsistence expenses of the CONTRACTOR's employees incurred in discharge of duties connected with the work.
 - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office and temporary facilities at the site and hand tools not owned by the workers, which are consumed in

the performance of the work, and cost less market value of such items used but not consumed which remain the property of the CONTRACTOR.

- c. Rentals of all construction equipment and machinery and the parts thereof whether rented from the CONTRACTOR or others in accordance with rental agreements approved by the CITY and the costs of transportation, loading, unloading, installation, dismantling and removal thereof - all in accordance with terms of said rental agreements. The rental of any such equipment, machinery or parts shall cease when the use thereof is no longer necessary for the work.
- d. Sales, consumer, use or similar taxes related to the work, and for which the CONTRACTOR is liable, imposed by Regulatory Requirements.
- e. Deposits lost for causes other than negligence of the CONTRACTOR, any Subcontractor or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
- f. Losses and damages (and related expenses), not compensated by insurance or otherwise, to the Work or otherwise sustained by the CONTRACTOR in connection with the performance and furnishing of the Work provided they have resulted from causes other than the negligence of the CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of the CITY. No such losses, damages and expenses shall be included in the Cost of the Work for the purpose of determining the CONTRACTOR's Fee. If, however, any such loss or damage requires reconstruction and the CONTRACTOR is placed in charge thereof, the CONTRACTOR shall be paid for services a fee proportionate to that stated in paragraphs 10.6.2.a and 10.6.2.b.
- g. The cost of utilities, fuel and sanitary facilities at the site.
- h. Minor expenses such as telegrams, long distance telephone calls, telephone service at the site, expressage and similar petty cash items in connection with the work.
- i. Cost of premiums for additional bonds and insurance required because of changes in the work and premiums for property insurance coverage within the limits of the deductible amounts established by the CITY in accordance with Article 5.

10.5 Excluded Costs:

The term Cost of the Work shall not include any of the following:

- 10.5.1 Payroll costs and other compensation of CONTRACTOR's officer, executives, principles (of partnership and sole proprietorships), general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agency, expeditors, timekeepers, clerks and other personnel employed by CONTRACTOR whether at the site or in CONTRACTOR's principal or a branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in paragraph 10.4.1 or specifically covered by paragraph 10.4.4 - all of which are to be considered administrative costs covered by the CONTRACTOR's Fee.
- 10.5.2 Expenses of CONTRACTOR's principal and branch offices other than CONTRACTOR's office at the site.
- 10.5.3 Any part of CONTRACTOR's capital expenses including interest on CONTRACTOR's capital employed for the Work and charges against CONTRACTOR for delinquent payments.
- 10.5.4 Cost of premiums for all bonds and for all insurance whether or not CONTRACTOR is required by the Contract Documents to purchase and maintain the same (except for the cost of premiums covered by subparagraph 10.4.5.i above).
- 10.5.5 Costs due to the negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of

Defective Work, disposal of materials or equipment wrongly supplied and making good any damage to property.

10.5.6 Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in paragraph 10.4.

10.6 CONTRACTOR's Fee:

The CONTRACTOR's Fee allowed to CONTRACTOR for overhead and profit shall be determined as follows:

10.6.1 A mutually acceptable fixed fee; or if none can be agreed upon.

10.6.2 A fee based on the following percentages of the various portions of the Cost of the Work:

- a. For costs incurred under paragraphs 10.4.1 and 10.4.2, the CONTRACTOR's Fee shall be twenty percent;
- b. For costs incurred under paragraph 10.4.3, the CONTRACTOR's Fee shall be fifteen percent; and if a sub-contract is on the basis of Cost of the Work Plus a Fee, the maximum allowable to CONTRACTOR on account of overhead and profit of all subcontractors shall be fifteen percent;
- c. No fee shall be payable on the basis of costs itemized under paragraphs 10.4.4, 10.4.5 and 10.5;
- d. The amount of credit to be allowed by the CONTRACTOR to the CITY for any such change which results in a net decrease in cost will be the amount of the actual net decrease plus a deduction in CONTRACTOR's Fee by an amount equal to ten percent of the net decrease; and
- e. When both additions and credits are involved in any one change, the adjustment in CONTRACTOR's Fee shall be computed on the basis of the net change in accordance with paragraphs 10.6.2.a through 10.6.2.d, inclusive.

10.7 Cost Breakdown:

Whenever the cost of any work is to be determined pursuant to paragraphs 10.4 and 10.5, the CONTRACTOR will submit in form acceptable to the CITY an itemized cost breakdown together with supporting data.

10.8 Cash Allowances:

It is understood the CONTRACTOR has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be done by such Subcontractors or Suppliers and for such sums within the limit of the allowances as may be acceptable to the Contracting Officer. CONTRACTOR agrees that:

- 10.8.1 The allowances include the cost to CONTRACTOR (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the site, and all applicable taxes; and
- 10.8.2 CONTRACTOR's cost for unloading and handling on the site, labor, installation costs, overhead, profit and other expenses contemplated for the allowances have been included in the Contract Price and not in the allowances. No demand for additional payment on account of any thereof will be valid.

Prior to final payment, an appropriate Change Order will be issued to reflect actual amounts due the CONTRACTOR on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

10.9 Unit Price Work:

- 10.9.1 Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the established unit prices for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Contract. The estimated quantities of items of Unit Price Work are not guaranteed and are

solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by the CONTRACTOR will be made by the CITY in accordance with paragraph 10.9.3.

10.9.2 Each unit price will be deemed to include an amount considered by the CONTRACTOR to be adequate to cover the CONTRACTOR's overhead and profit for each separately identified item. If the "Basis of Payment" clause in the Contract Documents relating to any unit price in the bid schedule requires that the said unit price cover and be considered compensation for certain work or material essential to the item, this same work or material will not also be measured or paid for under any other pay item which may appear elsewhere in the Contract Documents.

10.9.3 Payment to the CONTRACTOR shall be made only for the actual quantities of work performed and accepted or materials furnished, in conformance with the Contract Documents. When the accepted quantities of work or materials vary from the quantities stated in the bid schedule, or change documents, the CONTRACTOR shall accept as payment in full, payment at the stated unit prices for the accepted quantities of work and materials furnished, completed and accepted; except as provided below:

- a. When the quantity of work to be done or material to be furnished under any item, for which the total cost of the item exceeds 10% of the total Contract Price, is increased by more the 25 per cent of the quantity stated in the bid schedule, or change documents, either party to the Contract, upon demand, shall be entitled to an equitable unit price adjustment on the portion of the work above 125 per cent of the quantity stated in the bid schedule.
- b. When the quantity of work to be done or material to be furnished under any major item, for which the total cost of the item exceeds 10% of the total Contract Price, is decreased by more than 25 per cent of the quantity stated in the bid schedule, or change documents either party to the contract, upon demand, shall be entitled to an equitable price adjustment for the quantity of work performed or material furnished, limited to a total payment of not more the 75 per cent of the amount originally bid for the item.

10.10 Determinations for Unit Prices:

The Contracting Officer will determine the actual quantities and classifications of Unit Price Work performed by the CONTRACTOR. The Contracting Officer will review with the CONTRACTOR preliminary determinations on such matters before certifying the prices on the Bid Schedule. The Contracting Officer's certification thereon will be final and binding on the CONTRACTOR, unless, within ten days after the date of any such decisions, the CONTRACTOR delivers to the Contracting Officer written notice of intention to appeal from such a decision.

ARTICLE 11 - CONTRACT TIME; COMPUTATION AND CHANGE

11.1 Commencement of Contract Time; Notice to Proceed:

The Contract Time will commence to run on the day indicated in the Notice to Proceed.

11.2 Starting the Work:

No work on contract items shall be performed before the effective date of the Notice to Proceed. The CONTRACTOR shall notify the Contracting Officer at least 24 hours in advance of the time actual construction operations will begin. The CONTRACTOR may request a limited Notice to Proceed after award has been made, to permit him to order long lead materials which could cause delays in project completion. However, granting is within the sole discretion of the Contracting Officer, and refusal or failure to grant a limited Notice to Proceed shall not be a basis for claiming for delay, extension of time, or alteration of price.

11.3 Computation of Contract Time:

- 11.3.1 When the contract time is specified on a calendar days basis, all work under the contract shall be completed within the number of calendar days specified. The count of contract time begins on the day following receipt of the Notice to Proceed by the CONTRACTOR, if no starting day is stipulated therein. Calendar days shall continue to be counted against contract time until and including the date of Final Completion of the Work.

11.3.2 When the Contract completion time is specified as a fixed calendar date, it shall be the date of Final Completion.

11.4 Time Change:

The Contract Time may only be changed by a Change Order or Supplemental Agreement.

11.5 Extension Due to Delays:

The right of the CONTRACTOR to proceed shall not be terminated nor the CONTRACTOR charged with liquidated or actual damages because of any delays to the completion of the Work due to unforeseeable causes beyond the control and without the fault or negligence of the CONTRACTOR, including, but not restricted to the following: acts of God or of the public enemy, acts of the CITY in contractual capacity, acts of another contractor in the performance of a contract with the CITY, floods, fires, epidemics, quarantine restrictions, strikes, freight embargoes, unusually severe weather and delays of Subcontractors or Suppliers due to such causes. Any delay in receipt of materials on the site, caused by other than one of the specifically mentioned occurrences above, does not of itself justify a time extension. Provided, that the CONTRACTOR shall within twenty four (24) hours from the beginning of any such delay (unless the Contracting Officer shall grant a further period of the time prior to the date of final settlement of the Contract) notify the Contracting Officer in writing of the cause of delay. The Contracting Officer shall ascertain the facts and the extent of the delay and extend the time for completing the Work when the findings of fact justify such an extension.

11.6 Essence of Contract:

All time limits stated in the Contract Documents are of the essence of the Contract.

11.7 Reasonable Completion Time:

It is expressly understood and agreed by and between the CONTRACTOR and the CITY that the date of beginning and the time for Final Completion of the Work described herein are reasonable times for the completion of the Work.

11.8 Delay Damages:

Whether or not the CONTRACTOR's right to proceed with the Work is terminated, he and his sureties shall be liable for damages resulting from his refusal or failure to complete the Work within the specified time. Liquidated damages for delay shall be paid by the CONTRACTOR or his Surety to the Department in the amount as specified in the Supplementary Conditions for each Calendar Day the completion of the Work or any part thereof is delayed beyond the Contract Time required by the Contract, or any extension thereof. If such amount of liquidated damages is not established by the Contract Documents, then the CONTRACTOR and his Surety shall be liable to the Department for any actual damages occasioned by such delay. The CONTRACTOR acknowledges that the liquidated damages established herein are not a penalty but rather constitute an estimate of damages that the Department will sustain by reason of delayed completion. These liquidated damages are intended as compensation for losses difficult to estimate, and include those items enumerated in the Supplementary Conditions. These damages will continue to run both before and after termination in the event of default termination. These liquidated damages do not cover excess costs of completion or the CITY's costs, fees, and charges related to reprocurement. If a default termination occurs, the Contractor or his Surety shall pay in addition to these damages, all excess costs and expenses related to completion as provided by Article 14.2.5.

ARTICLE 12 - QUALITY ASSURANCE

12.1 Warranty and Guaranty:

The CONTRACTOR warrants and guarantees to the CITY that all Work will be in accordance with the Contract Documents and will not be Defective. Prompt notice of all defects shall be given to the CONTRACTOR. All Defective Work, whether or not in place, may be rejected, corrected or accepted as provided for in this Article.

12.2 Access to Work:

The CITY and the CITY's representatives, testing agencies and governmental agencies with jurisdiction interests will have access to the Work at reasonable times for their observation, inspecting and testing. The CONTRACTOR shall provide proper and safe conditions for such access.

12.3 Tests and Inspections:

- 12.3.1 The CONTRACTOR shall give the Contracting Officer timely notice of readiness of the Work for all required inspections, tests or approvals.
- 12.3.2 If Regulatory Requirements of any public body having jurisdiction require any Work (or part thereof) to specifically be inspected, tested or approved, the CONTRACTOR shall assume full responsibility therefor, pay all costs in connection therewith and furnish the Contracting Officer the required certificates of inspection, testing or approval. The CONTRACTOR shall also be responsible for and shall pay all costs in connection with any inspection or testing required in connection with CITY's acceptance of a Supplier of materials or equipment proposed to be incorporated in the Work, or of materials or equipment submitted for approval prior to the CONTRACTOR's purchase thereof for incorporation in the Work. The cost of all inspections, tests and approvals in addition to the above which are required by the Contract Documents shall be paid by the CONTRACTOR. The CITY may perform additional tests and inspections which it deems necessary to insure quality control. All such failed tests or inspections shall be at the CONTRACTOR's expense.
- 12.3.3 If any Work (including the work of others) that is to be inspected, tested or approved is covered without written concurrence of the Contracting Officer, it must, if requested by the Contracting Officer, be uncovered for observation. Such uncovering shall be at the CONTRACTOR's expense unless the CONTRACTOR has given the Contracting Officer timely notice of CONTRACTOR's intention to cover the same and the Contracting Officer has not acted with reasonable promptness in response to such notice.
- 12.3.4 Neither observations nor inspections, test or approvals by the CITY of others shall relieve the CONTRACTOR from the CONTRACTOR's obligations to perform the Work in accordance with the Contract Documents.

12.4 Uncovering Work:

- 12.4.1 If any Work is covered contrary to the written request of the Contracting Officer, it must, if requested by the Contracting Officer, be uncovered for the contracting Officer's observation and replaced at the CONTRACTOR's expense.
- 12.4.2 If the Contracting Officer considers it necessary or advisable that covered Work be observed, inspected or tested, the CONTRACTOR, at the Contracting Officer's request, shall uncover, expose or otherwise make available for observation, inspection or testing as the Contracting Officer may require, that portion of the Work in question, furnishing all necessary labor, material and equipment. If it is found that such Work is Defective, the CONTRACTOR shall bear all direct, indirect and consequential costs of such uncovering, exposure, observation, inspection and testing and of satisfactory reconstruction, (including but not limited to fees and charges of engineers, architects, attorneys and other professional) and the CITY shall be entitled to an appropriate decrease in the Contract Price. If, however, such Work is not found to be Defective, the CONTRACTOR shall be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to such uncovering, exposure, observation, inspection, testing and reconstruction.

12.5 CITY May Stop the Work:

If the Work is Defective, or the CONTRACTOR fails to supply suitable materials or equipment, or fails to furnish or perform the Work in such a way that the completed Work will conform to the Contract Documents, the Contracting Officer may order the CONTRACTOR to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of the Contracting Officer to stop the Work shall not give rise to any duty on the part of the Contracting Officer to exercise this right for the benefit of the CONTRACTOR or any other party.

12.6 Correction or Removal of Defective Work:

If required by the Contracting Officer, the CONTRACTOR shall promptly, as directed, either correct all Defective Work, whether or not fabricated, installed or completed, or, if the Work has been rejected by the Contracting Officer, remove it from the site and replace it with Work which conforms to the requirements of the Contract Documents. The CONTRACTOR shall bear all direct, indirect and consequential costs of such correction removal (including but not limited to fees and charges of engineers, architects, attorneys and other professionals) made necessary thereby.

12.7 One Year Correction Period:

If within one year after the date of Final Completion or such longer period of time as may be prescribed by Regulatory Requirements or by the terms of any applicable special guarantee required by the Contract Documents or by any specific provision of the Contract Documents, any Work is found to be Defective, the CONTRACTOR shall promptly, without cost to the CITY and in accordance with the Contracting Officer's written instructions, either correct such Defective Work, or, if it has been rejected by the Contracting Officer, remove it from the site and replace it with conforming Work. If the CONTRACTOR does not promptly comply with the terms of such instructions, or in an emergency where delay would cause serious risk of loss or damage, the CITY may have the Defective Work corrected or the rejected Work removed and replaced, and all direct, indirect and consequential costs of such removal and replacement (including but not limited to fees and charges of engineers, architects, attorneys and other professionals) will be paid by the CONTRACTOR. In special circumstances where a particular item of equipment is placed in continuous service for the benefit of the CITY before Substantial Completion of all the Work, the correction period for the item may begin on an earlier date if so provided in the Specifications or by Change Order. Provisions of this paragraph are not intended to shorten the Statute of Limitations for bringing an action.

12.8 Acceptance of Defective Work:

Instead of requiring correction or removal and replacement of Defective Work, the Contracting Officer may accept defective Work, the CONTRACTOR shall bear all direct, indirect and consequential costs attributable to the Contracting Officer's evaluation of and determination to accept such Defective Work (costs to include but not be limited to fees and charges of engineers, architects, attorneys and other professionals). If any such acceptance occurs prior to final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and the CITY shall be entitled to an appropriate decrease in the Contract Price. If the CITY has already made final payment to the CONTRACTOR, an appropriate amount shall be paid by the CONTRACTOR or his Surety to the CITY.

12.9 CITY May Correct Defective Work:

If the CONTRACTOR fails within a reasonable time after written notice from the Contracting Officer to proceed to correct Defective Work or to remove and replace rejected Work as required by the Contracting Officer in accordance with paragraph 12.6, or if the CONTRACTOR fails to perform the Work in accordance with the Contract Documents, or if the CONTRACTOR fails to comply with any other provision of the Contract Documents, the CITY may, after seven days' written notice to the CONTRACTOR, correct and remedy any such deficiency. In exercising the rights and remedies under this paragraph the CITY shall proceed expeditiously. To the extent necessary to complete corrective and remedial action, the Contracting Officer may exclude the CONTRACTOR from all or part of the site, take possession of all or part of the Work, and suspend the CONTRACTOR's services related thereto, take possession of the CONTRACTOR's tool, appliances, construction equipment and machinery at the site and incorporate in the Work all materials and equipment stored at the site or approved remote storage sites or for which the CITY has paid the CONTRACTOR but which are stored elsewhere, the CONTRACTOR shall allow the Contracting Officer and his authorized representatives such access to the site as may be necessary to enable the Contracting Officer to exercise the rights and remedies under this paragraph. All direct, indirect and consequential costs of the CITY or its agents in exercising such rights and remedies will be charge against the CONTRACTOR, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and the CITY shall be entitled to an appropriate decrease in the Contract Price. Such direct, indirect and consequential costs will include but not be limited to fees and charges of engineers, architects, attorneys and other professionals, all court and arbitration costs and all cost of repair and replacement of work of others destroyed or damaged by correction, removal or replacement of the CONTRACTOR's Defective Work. The CONTRACTOR shall not be allowed an extension of the Contract Time because of any delay in performance of the Work attributable to the exercise by the Contracting Officer of the CITY's rights and remedies hereunder.

ARTICLE 13 - PAYMENTS TO CONTRACTOR AND COMPLETION

13.1 Schedule of Values:

The Schedule of Values established as provided in paragraph 6.6 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to the Contracting Officer. Progress payments on account of Unit Price Work will be based on the number of units completed.

13.2 Preliminary Payments:

Upon approval of the Schedule of Values the CONTRACTOR may be paid for direct costs substantiated by paid invoices and other prerequisite documents required by the General Requirements. Direct costs shall include the cost of Bonds, insurance, approved materials stored on the site or at approved remote storage sites, deposits required by a Supplier prior to fabricating materials, and other approved direct mobilization costs substantiated as indicated above. These payments shall be included as a part of the total Contract Price as stated in the Contract.

13.3 Application for Progress Payment:

The CONTRACTOR shall submit to the Contracting Officer for review an Application for Payment filled out and signed by the CONTRACTOR covering the Work completed as of the date of the Application for Payment and accompanied by such supporting documentation as is required by the Contract Documents. Progress payments will be made as the Work progresses on a monthly basis or twice a month when requested by the CONTRACTOR, but only when the approved invoice exceeds \$10,000.00.

13.4 Review of Applications for Progress Payments:

Contracting Officer will, either indicate in writing a recommendation of payment, or return the Application for Payment to the CONTRACTOR indicating in writing the Contracting Officer's reasons for refusing to recommend payment. If the latter case, the CONTRACTOR may make the necessary corrections and resubmit the Application for Payment.

13.5 Stored Materials and Equipment:

If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice or other documentation warranting that the CITY has received the materials and equipment free and clear of all charges, security interests and encumbrances and evidence that the materials and equipment are covered by appropriate property insurance and other arrangements to protect the CITY's interest therein, all of which will be satisfactory to the Contracting Officer. No payment will be made for perishable materials that could be rendered useless because of long storage periods. No progress payment will be made for living plant materials until planted. The payment may be reduced by an amount equal to transportation and handling cost if the materials are stored offsite, in a remote location, or will require special handling.

13.6 CONTRACTOR's Warranty of Title:

The CONTRACTOR warrants and guarantees that title to all Work, materials and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to the CITY no later than the time of payment free and clear of any claims, liens, security interests and further obligations.

13.7 Withholding of Payments:

The CITY may withhold or refuse payment for any of the reasons listed below provided it gives written notice of its intent to withhold and of the basis for withholding:

13.7.1 The Work is Defective, or completed Work has been damaged requiring correction or replacement, or has been installed without approval of Shop Drawing, or by an unapproved Subcontractor.

13.7.2 The Contract Price has been reduced by Change Order.

- 13.7.3 The CITY has been required to correct Defective Work or complete Work in accordance with paragraph 12.9.
- 13.7.4 The CITY's actual knowledge of the occurrence of any of the events enumerated in paragraphs 14.2.1.a through 14.2.1.k inclusive.
- 13.7.5 Claims have been made against the CITY or against the funds held by the CITY on account of the CONTRACTOR's actions or inactions in performing this Contract, or there are other items entitling the CITY to a set off.
- 13.7.6 Subsequently discovered evidence or the results of subsequent inspections or test, nullify any previous payments for reasons stated in subparagraphs 13.7.1 through 13.7.5.
- 13.7.7 The CONTRACTOR has failed to fulfill or is in violation of any of his obligations under any provision of this Contract.

13.8 Retainage:

At any time the CITY finds that satisfactory progress is not being made it may in addition to the amounts withheld under 13.7 retain a maximum amount equal to 10% of the total amount earned on all subsequent progress payments. This retainage may be released at such time as the Contracting Officer finds that satisfactory progress is being made.

13.9 Request for Release of Funds:

If the CONTRACTOR believes the basis for withholding is invalid or no longer exists, immediate written notice of the facts and Contract provisions on which the CONTRACTOR relies, shall be given to the CITY, together with a request for release of funds and adequate documentary evidence proving that the problem has been cured. In the case of withholding which has occurred at the request of the Department of Labor, the CONTRACTOR shall provide a letter from the Department of Labor stating that withholding is no longer requested. Following such a submittal by the CONTRACTOR, the CITY shall have a reasonable time to investigate and verify the facts and seek additional assurances before determining whether release of withheld payments is justified.

13.10 Substantial Completion:

When the CONTRACTOR considers the Work ready for its intended use the CONTRACTOR shall notify the Contracting Officer in writing that the Work of a designated portion thereof is substantially complete (except for items specifically listed by the CONTRACTOR as incomplete) and request that the CITY issue a certificate of Substantial Completion. Within a reasonable time thereafter, the Contracting Officer, the CONTRACTOR and appropriate Consultant(s) shall make an inspection of the Work to determine the status of completion. If the Contracting Officer does not consider the Work substantially complete, the Contracting Officer will notify the CONTRACTOR in writing giving the reasons therefor. If the Contracting Officer considers the Work substantially complete, the Contracting Officer will within fourteen days execute and deliver to the CONTRACTOR a certificate of Substantial Completion with tentative list of items to be completed or corrected. At the time of delivery of the certificate of Substantial Completion the Contracting Officer will deliver to the CONTRACTOR a written division of responsibilities pending Final Completion with respect to security, operation, safety, maintenance, heat, utilities, insurance and warranties which shall be consistent with the terms of the Contract Documents. The CITY shall be responsible for all CITY costs resulting from the initial inspection and the first re-inspection, the CONTRACTOR shall pay all costs incurred by the CITY resulting from re-inspections, thereafter.

13.11 Access Following Substantial Completion:

The CITY shall have the right to exclude the CONTRACTOR from the Work after the date of Substantial Completion, but the CITY shall allow CONTRACTOR reasonable access to complete or correct items on the tentative list.

13.12 Final Inspection:

Upon written notice from the CONTRACTOR that the entire Work or an agreed portion thereof is complete, the Contracting Officer will make a final inspection with the CONTRACTOR and appropriate Consultants and will notify the CONTRACTOR in writing of all particulars in which this inspection reveals that the Work is incomplete or Defective.

The CONTRACTOR shall immediately take such measures as are necessary to remedy such deficiencies. The CONTRACTOR shall pay for all costs incurred by the CITY resulting from re-inspections.

13.13 Final Application for Payment:

After the CONTRACTOR has completed all such corrections to the satisfaction of the Contracting Officer and delivered all maintenance and operating instructions, schedules, guarantees, bonds, certificates of payment to all laborers, Subcontractors and Suppliers, certificates of inspection, marked-up record documents and other documents - all as required by the Contract Documents, and after the Contracting Officer has indicated that the Work is acceptable (subject to the provisions of paragraph 13.17), the CONTRACTOR may make application for final payment following the procedure for progress payments. The final Application for Payment shall be accompanied by all certificates, warranties, guaranties, releases, affidavits, and other documentation required by the Contract Documents.

13.14 Final Payment and Final Completion:

13.14.1 If on the basis of the Contracting Officer's observation of the Work during construction and final inspection, and the Contracting Officer's review of the final Application for Payment and accompanying documentation - all as required by the Contract Documents, the Contracting Officer is satisfied that the Work has been completed and the CONTRACTOR's other obligations under the Contract Documents have been fulfilled, the CITY will process final Application for Payment. Otherwise, the Contracting Officer will return the Application for Payment to the CONTRACTOR, indicating in writing the reasons for refusing to process final payment, in which case the CONTRACTOR shall make the necessary corrections and resubmit the final Application for Payment.

13.14.2 If, through no fault of the CONTRACTOR, Final Completion of the Work is significantly delayed, the Contracting Officer shall, upon receipt of the CONTRACTOR's final Application for Payment, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by the CITY for Work not fully completed or corrected is less than the retainage provided for in paragraph 13.8, and if Bonds have been furnished as required in paragraph 5.1, the written consent of the Surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the CONTRACTOR to the CITY with the application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

13.15 Final Acceptance:

Following receipt of the CONTRACTOR's Release with no exceptions, and certification that laborers, Subcontractors and materialmen have been paid, certification of payment of payroll and revenue taxes, and final payment to the CONTRACTOR, the CITY will issue a letter of Final Acceptance, releasing the CONTRACTOR from further obligations under the Contract, except as provided in paragraph 13.16.

13.16 CONTRACTOR's Continuing Obligation:

The CONTRACTOR's obligation to perform and complete the Work and pay all laborers, Subcontractors, and materialmen in accordance with the Contract Documents shall be absolute. Neither any progress or final payment by the CITY, nor the issuance of a certificate of Substantial Completion, nor any use or occupancy of the Work or any part thereof by the CITY or Using Agency, nor any act of acceptance by the CITY nor any failure to do so, nor any review and approval of a Shop Drawing or sample submission, nor any correction of Defective Work by the CITY will constitute an acceptance of Work not in accordance with the Contract Documents or a release of the CONTRACTOR's obligation to perform the Work in accordance with the Contract Documents.

13.17 Waiver of Claims by CONTRACTOR:

The making and acceptance of final payment will constitute a waiver of all claims by the CONTRACTOR against the CITY other than those previously made in writing and still unsettled.

13.18 No Waiver of Legal Rights:

The CITY shall not be precluded or be stopped by any payment, measurement, estimate, or certificate made either before or after the completion and acceptance of the Work and payment therefor, from showing the true amount and character of the Work performed and materials furnished by the CONTRACTOR, nor from showing that any payment, measurement, estimate or certificate is untrue or is incorrectly made, or that the Work or materials are Defective. The CITY shall not be precluded or stopped, not with standing any such measurement, estimate, or certificate and payment in accordance therewith, from recovering from the CONTRACTOR or his Sureties, or both, such damages as it may sustain by reason of his failure to comply with requirements of the Contract Documents. Neither the acceptance by the CITY, or any representative of the CITY, nor any payment for or acceptance of the whole or any part of the Work, nor any extension of the Contract Time, nor any possession taken by the CITY, shall operate as a waiver of any portion of the Contract, or of the power herein reserved, or of any right to damages. A waiver by the CITY of any breach of the Contract shall not be held to be a waiver of any other subsequent breach.

ARTICLE 14 - SUSPENSION OF WORK, DEFAULT AND TERMINATION

14.1 CITY May Suspend Work:

14.1.1 The CITY may, at any time suspend the Work or any portion thereof by notice in writing to the CONTRACTOR. If the Work is suspended without cause the CONTRACTOR shall be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to any suspension if the CONTRACTOR makes an approved claim therefor as provided in Article 15. However, no adjustment shall be made under this clause for any suspension, delay, or interruption to the extent that suspension is due to the fault or negligence of the CONTRACTOR, or that suspension is necessary for Contract compliance, or that performance would have been so suspended, delayed, or interrupted by any other cause, including the fault or negligence of the CONTRACTOR.

14.1.2 In case of suspension of Work, the CONTRACTOR shall be responsible for preventing damage to or loss of any of the Work already performed and of all materials whether stored on or off the site or approved remote storage sites.

14.2 Default of Contract:

14.2.1 If the CONTRACTOR:

- a. Fails to begin the Work under the Contract within the time specified in the "Proposal", or
- b. Fails to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workmen or suitable materials or equipment or failure to adhere to the progress schedule established under paragraph 6.6 as revised from time to time), or
- c. Performs the Work unsuitably or neglects or refuses to remove materials or to correct Defective Work.
- d. Discontinues the prosecution of the Work, or
- e. Fails to resume Work which has been discontinued within a reasonable time after notice to do so, or
- f. Becomes insolvent or is declared bankrupt, or commits any act of bankruptcy or insolvency except as prohibited by 11 U.S.C. 363e, or
- g. Allows any final judgment to stand against him unsatisfied for period of 60 days, or
- h. Makes an assignment for the benefit of creditors without the consent of the Contracting Officer, or
- i. Disregards Regulatory Requirements of any public body having jurisdiction, or
- j. Otherwise violates in any substantial way any provisions of the Contract Documents, or

- k. For any cause whatsoever, fails to carry on the Work in an acceptable manner, the Contracting Officer may give notice in writing to the CONTRACTOR and his Surety of such delay, neglect, or default.

If the CONTRACTOR or Surety, within the time specified in the above Notice of Default, shall not proceed in accordance therewith, then the CITY may, upon written notification from the Contracting Officer of the fact of such delay, neglect or default and the CONTRACTOR's failure to comply with such notice, have full power and authority without violating the Contract, to take the prosecution of the Work out of the hands of the CONTRACTOR. The CITY may terminate the services of the CONTRACTOR, exclude the CONTRACTOR from the site and take possession of the Work and of all the CONTRACTOR's tools, appliances, construction equipment and machinery at the site and use the same to the full extent they could be used by the CONTRACTOR (without liability to the CONTRACTOR for trespass or conversion), incorporate in the Work all materials and equipment stored at the site or for which the CITY has paid the CONTRACTOR but which are stored elsewhere, and finish the Work as the CITY may deem expedient. The CITY may enter into an agreement for the completion of said Contract according to the terms and provisions thereof, or use such other methods that in the opinion of the Contracting Officer are required for the completion of said Contract in an acceptable manner.

- 14.2.3 The Contracting Officer may, by written notice to the CONTRACTOR and his Surety or his representative, transfer the employment of the Work from the CONTRACTOR to the Surety, or if the CONTRACTOR abandons the Work undertaken under the Contract, the Contracting Officer may, at his option with written notice to the Surety and without any written notice to the CONTRACTOR, transfer the employment for said Work directly to the Surety. The Surety shall submit its plan for completion of the Work, including any contracts or agreements with third parties for such completion, to the CITY for approval prior to beginning completion of the Work. Approval of such contracts shall be in accordance with all applicable requirements and procedures for approval of subcontracts as stated in the Contract Documents.
- 14.2.4 Upon receipt of the notice terminating the services of the CONTRACTOR, the Surety shall enter upon the premises and take possession of all materials, tools, and appliances thereon for the purpose of completing the Work included under the Contract and employ by contract or otherwise any person or persons to finish the Work and provide the materials therefor, without termination of the continuing full force and effect of this Contract. In case of such transfer of employment to the Surety, the Surety shall be paid in its own name on estimates covering Work subsequently performed under the terms of the Contract and according to the terms thereof without any right of the CONTRACTOR to make any claim for the same or any part thereof.
- 14.2.5 If the Contract is terminated for default, the CONTRACTOR and the Surety shall be jointly and severally liable for damages for delay as provided by Article 11.8, and for the excess cost of completion, and all costs and expenses incurred by the CITY in completing the Work or arranging for completion of the Work, including but not limited to costs of assessing the Work to be done, costs associated with advertising, soliciting or negotiating for bids or proposals for completion, and other procurement costs. Following termination the CONTRACTOR shall not be entitled to receive any further balance of the amount to be paid under the contract until the work is fully finished and accepted, at which time if the unpaid balance exceeds the amount due the CITY and any amounts due to persons for whose benefit the CITY has withheld funds, such excess shall be paid by the CITY to the CONTRACTOR. If the damages, costs, and expenses due the CITY exceed the unpaid balance, the CONTRACTOR and his Surety shall pay the difference.
- 14.2.6 If, after notice of termination of the CONTRACTOR's right to proceed under the provisions of this clause, it is determined for any reason that the CONTRACTOR was not in default under the provisions of this clause, or that the delay was excusable under the provisions of this clause, or that termination was wrongful, the rights and obligations of the parties shall be determined in accordance with the clause providing for convenience termination.

14.3 Rights or Remedies:

Where the CONTRACTOR's services have been so terminated by the CITY, the termination will not affect any rights or remedies of the CITY against the CONTRACTOR then existing or which may thereafter accrue. Any retention or payment of moneys due the CONTRACTOR by the CITY will not release the CONTRACTOR from liability.

14.4 Convenience Termination:

- 14.4.1 The performance of the Work may be terminated by the CITY in accordance with this section in whole or in part, whenever, for any reason the Contracting Officer shall determine that such termination is in the best interest of the CITY. Any such termination shall be effected by delivery to the CONTRACTOR of a Notice of Termination, specifying termination is for the convenience of the CITY the extent to which performance of Work is terminated, and the date upon which such termination becomes effective. Immediately upon receipt of a Notice of Termination and except as otherwise directed by the Contracting Officer the CONTRACTOR shall:
- a. Stop Work on the date and to the extent specified in the Notice of Termination;
 - b. Place no further orders or subcontracts for materials, services, or facilities except as may be necessary for completion of such portion of the Work as is not terminated;
 - c. Terminate all orders and subcontracts to the extent that they relate to the performance of Work terminated by the Notice of Termination;
 - d. With the written approval of the Contracting Officer, to the extent he may require, settle all outstanding liabilities and all claims arising out of such termination of orders and subcontracts, the cost of which would be reimbursable, in whole, or in part, in accordance with the provisions of the Contract;
 - e. Submit to the Contracting Officer a list, certified as to quantity and quality, of any or all items of termination inventory exclusive of items the disposition of which had been directed or authorized by the Contracting Officer;
 - f. Transfer to the Contracting Officer the completed or partially completed record drawings, Shop Drawings, information, and other property which, if the Contract had been completed, would be required to be furnished to the CITY;
 - g. Take such action as may be necessary, or as the Contracting Officer may direct, for the protection and preservation of the property related to the Contract which is in the possession of the CONTRACTOR and in which the CITY has or may acquire any interest. The CONTRACTOR shall proceed immediately with the performance of the above obligations.
- 14.4.2 When the CITY orders termination of the Work effective on a certain date, all Work in place as of that date will be paid for in accordance with the Basis of Payment clause of the Contract. Materials required for completion and on hand but not incorporated in the Work will be paid for at cost plus 15% with materials becoming the property of the CITY - or the CONTRACTOR may retain title to the materials and be paid an agreed upon lump sum. Materials on order shall be canceled, and the CITY shall pay reasonable factory cancellation charges with the option of taking delivery of the materials in lieu of payment of cancellation charges. The CONTRACTOR shall be paid 10% of the cost, freight not included, of materials canceled, and direct expenses only for CONTRACTOR chartered freight transport which cannot be canceled without charges, to the extent that the CONTRACTOR can establish them. The extra costs due to cancellation of Bonds and insurance and that part of job start-up and phase-out costs not amortized by the amount of Work accomplished shall be paid by the CITY. Charges for loss of profit or consequential damages shall not be recoverable except as provided above.
- 14.4.3 The termination claim shall be submitted promptly, but in no event later than 90 days from the effective date of termination, unless one or more extensions in writing are granted by the Contracting Officer upon request of the CONTRACTOR made in writing within the 90-day period. Upon failure of the CONTRACTOR to submit his termination claim within the time allowed, the Contracting Officer may determine, on the basis of information available to him, the amount, if any, due to the CONTRACTOR by reason of the termination and shall thereupon pay to the CONTRACTOR so determined.
- 14.4.4 The CONTRACTOR and the Contracting Officer may agree upon whole or any part of the amount or amounts to be paid to the CONTRACTOR by reason of the total or partial termination of the Work pursuant to this section. The Contract shall be amended accordingly, and the CONTRACTOR shall be paid the agreed amount. In the event of the failure of the CONTRACTOR and the Contracting Officer to agree in whole or in

part, as provided heretofore, as to the amounts with respect to costs to be paid to the CONTRACTOR in connection with the termination of the Work the Contracting Officer shall determine, on the basis of information available to him, the amount, if any, due to the CONTRACTOR by reason of the termination and shall pay to the CONTRACTOR the amount determined as follows:

- a. All costs and expenses reimbursable in accordance with the Contract not previously paid to the CONTRACTOR for the performance of the Work prior to the effective date of the Notice of Termination;
- b. So far as not included under "a" above, the cost of settling and paying claims arising out of the termination of the Work under subcontracts or orders which are properly chargeable to the terminated portions of the Contract;
- c. The reasonable costs of settlement with respect to the terminated portion of the Contract heretofore, to the extent that these costs have not been covered under the payment provisions of the Contract.

14.4.5 The CONTRACTOR shall have the right of appeal under the CITY's claim procedures, as defined in Article 15, for any determination made by the Contracting Officer, except if the CONTRACTOR has failed to submit his claim within the time provided and has failed to request extension of such time, CONTRACTOR shall have no such right of appeal. In arriving at the amount due the CONTRACTOR under this section, there shall be deducted:

- a. All previous payments made to the CONTRACTOR for the performance of Work under the Contract prior to termination;
- b. Any claim for which the CITY may have against the CONTRACTOR;
- c. The agreed price for, or the proceeds of sale of, any materials, supplies, or other things acquired by the CONTRACTOR or sold pursuant to the provisions of this section and not otherwise recovered by or credited to the CITY; and,
- d. All progress payments made to the CONTRACTOR under the provisions of this section.

14.4.6 Where the Work has been terminated by the CITY said termination shall not affect or terminate any of the rights of the CITY against the CONTRACTOR or his Surety then existing or which may thereafter accrue because of such default. Any retention or payment of monies by the CITY due to the CONTRACTOR under the terms of the Contract shall not release the CONTRACTOR or his Surety from liability. Unless otherwise provided for in the Contract Documents, or by applicable statute, the CONTRACTOR, from the effective date of termination and for a period of three years after final settlement under this Contract, shall preserve and make available to the CITY at all reasonable times at the office of the CONTRACTOR, all its books, records, documents, and other evidence bearing on the cost and expenses of the CONTRACTOR under his Contract and relating to the Work terminated hereunder.

ARTICLE 15 - CLAIMS AND DISPUTES

15.1 Notification:

In addition to the notice requirements set out elsewhere in this Contract, if the CONTRACTOR becomes aware of any act or occurrence which may form the basis of a claim by the CONTRACTOR for additional compensation or an extension of time for performance, or if any dispute arises regarding a question of fact or interpretation of the contract, the CONTRACTOR shall immediately inform the Project Manager. If the matter cannot be resolved by agreement within 7 days, the CONTRACTOR shall, within the next 14 days, submit Intent to Claim in writing to the Project Manager. The Claim, if not resolved, shall be presented to the Project Manager, in writing, within 60 days following receipt of the Intent to Claim. Receipt of the Claim will be acknowledged in writing by the Project Manager. The CONTRACTOR agrees that unless these written notices are provided, the CONTRACTOR will have no entitlement to additional time or compensation for such act, event or condition. The CONTRACTOR shall in any case continue diligent performance of the Contract.

15.2 Presenting Claim:

The Claim shall specifically include the following:

- 15.2.1 The act, event or condition giving rise to the claim.
- 15.2.2 The Contract provisions which apply to the claim and under which relief is provided.
- 15.2.3 The item or items of Contract Work affected and how they are affected.
- 15.2.4 The specific relief requested, including contract time if applicable, and the basis upon which it was calculated.

15.3 Claim Validity, Additional Information, and Project Manager's Actions:

The Claim, in order to be valid, must not only show that the CONTRACTOR suffered damages or delay but that those conditions were actually a result of the act, event or condition complained of and that the Contract provides entitlement to relief to the CONTRACTOR for such act, event, or condition. The Project Manager reserves the right to make written request to the CONTRACTOR at any time for additional information which the CONTRACTOR may possess relative to the Claim. The CONTRACTOR agrees to provide the Project Manager such additional information within 30 days of receipt of such a request. Failure to furnish such additional information may be regarded as a waiver of the Claim. The Claim, if not resolved by agreement within 60 days of its receipt, will automatically be forwarded to the Contracting Officer for formal written decision.

15.4 Contracting Officer's Decision:

The CONTRACTOR will be furnished the Contracting Officer's Decision within the next 90 days, unless additional information is requested by the Contracting Officer. The Contracting Officer's Decision is final and conclusive unless fraudulent as to the Claim.

15.5 Notice of Appeal:

Within 30 days of receipt of the Decision, the CONTRACTOR may deliver a Notice of Appeal to the City Manager of Unalaska, Alaska. The Notice of Appeal shall include specific exceptions to the Contracting Officer's Decision, including specific provisions of the contract, which the CONTRACTOR intends to rely upon in the appeal. General assertions that the Contracting Officer's decision is contrary to law or fact are not sufficient.

15.6 City Manager's Decision:

The decision of the City Manager will be rendered within 120 days of Notice of Appeal. This decision constitutes the exhaustion of contractual and administrative remedies. The time limits given above may only be extended by mutual consent. The decision of the City Manager shall be final and conclusive unless the CONTRACTOR commences action through the court within 120 days from receipt thereof.

Part 4
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SECTION 01100 – DESCRIPTION OF WORK AND BASIS OF PAYMENT

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. All proposed work for the Unalaska Cells II-1 & II-2 Landfill Expansion will be constructed at the City of Unalaska landfill site, as shown on the Contract Drawings. The Work included under this contract consists of furnishing all labor, materials, equipment, supervision, and other facilities necessary to successfully complete the Work set forth in the Specifications, Drawings and the terms of the Contract.
- B. The Work that is presented in the Contract Documents includes the following:
 - 1. New landfill Cells II-1 & II-2, with associated leachate collection and conveyance system. Payment for this work shall be Bid Items 3 and 4.
 - 2. Site work, including all demolition, excavation, compaction, importing materials, drainage improvements, relocation/grading of existing materials, fencing, new monitoring wells, underdrain system, traveled surfaces, coordination with existing utilities, erosion and sedimentation control, dewatering, Storm Water Pollution Prevention Plan (SWPPP) activities, site restoration/cleanup, and all other site work as shown on the Drawings and described in the Specifications. Payment for this work shall be Bid Items 2, 6, and 7.
- C. It shall be the responsibility of the bidder to prepare the bid so that all materials, equipment and working arrangements shall harmoniously conform to the intent of the Contract Documents.

1.2 GENERAL INFORMATION

- A. This section covers the basis for payment for all Work. Work performed and the materials installed shall be in accordance with the Contract Documents.
- B. The Contract price paid for each Bid Item shall constitute full compensation for furnishing all material, equipment and supplies, performing all labor and operations for completion of Work as specified in the Contract Documents.
- C. Construction required to complete the Work as specified in these Contract Documents, but not specifically mentioned in this Section, shall be considered incidental to those Bid Items for which payment is made.
- D. The existing ground elevations and topographic features indicated have been provided by the Owner. The Contractor shall satisfy itself as to the current existing site conditions prior to disturbing the original ground.
- E. No separate payment shall be made for work in the Specifications that is not specifically enumerated in the pay items listed in this section. All work not

specified in these pay items shall be considered incidental to other items of work.

- F. The Contractor shall provide toilet facilities for workers.

1.3 QUALITY CONTROL

- A. The Contractor shall be responsible for project quality control, including running all tests, hiring qualified testing personnel, retaining state certified testing laboratories, and payment of all costs associated with the Contractor's Quality Control (CQC) program. Refer to each Technical Specification Section for details and requirements for submittals, installation/work plans, quality assurance plans, and field testing/reporting. The costs for the CQC program shall be incidental to the Work. The Engineer will test soil densities and concrete, and will provide overall project placement inspections.
- B. The Engineer shall be provided with all CQC information within 24 hours of actual testing or execution of the work; and shall have full access to any test or installation procedure during the course of the work.

1.4 SITE HEALTH AND SAFETY PLAN

- A. In addition to compliance with paragraph 6.17.4 of the Supplementary Conditions, the Contractor shall prepare a site-specific Health and Safety Plan that incorporates all requirements listed in the aforementioned paragraph 6.17.4.
- B. The Plan shall cover all work activities including the demolition, any dewatering, and all construction work.
- C. The Plan shall be prepared under the supervision of, and signed by, a Certified Industrial Hygienist (C.I.H.). At least, one copy of the Plan will be maintained at the work site at all times.

1.5 CONSTRUCTION SURVEYING, AS-BUILT SURVEY AND RECORD DRAWINGS

- A. Contractor shall provide all necessary surveying and layout to perform the work in the Contract Documents. Owner will provide primary survey control as shown on Drawing Sheet G-3.
- B. Contractor shall perform an as-built survey and prepare Record Drawings of the completed construction project.
- C. The as-built survey shall include, but not be limited to, the following:
 - 1. Re-establish any monuments or permanent control points damaged or lost during construction.
 - 2. Document all piping and appurtenances, cleanouts, inlets and outlets of drainage pipes, ditches, and final grades of the constructed facilities.

- The outer edges of the top of Cells II-1 & II-2 Liner shall be surveyed and tied to project horizontal and vertical datum.
3. Improvements shall be located by lines and grade, using the established "basis of control" provided in the Contract Documents.
- D. The Record Drawings shall include, but not be limited to, the following:
1. Lines, grades, and details of all improvements, and the interface with the existing landfill features.
 2. All abandoned or demolished systems of the original landfill.
 3. Swing ties or coordinates for all underground features such as piping, valves, cleanouts, manholes, etc.
 4. The Record Drawings shall be prepared in an approved AutoCAD format (2009 or Civil3D). Draft Drawings shall be submitted to the Engineer for review. The Drawings will not be considered completed until the City issues final approval in writing.
 5. The Drawings shall be prepared and stamped by a professional land surveyor (PLS) currently licensed by the State of Alaska.
- E. Payment for the work described in A of Subsection 1.5 shall be incidental to Bid Items 2, 3, and 4. Payment for the work described in B, C, and D of Subsection 1.5 shall be under Bid Item 6.

1.6 BASIS OF PAYMENT

- A. Bid Items:

Bid Item 1 – Site Mobilization and Demobilization

Payment for Mobilization and Demobilization shall be based on the Lump Sum (LS) stated in the Bid Proposal. This payment shall be full compensation for all costs of all materials, labor, equipment, and incidentals necessary to complete this item. Payment for Mobilization and Demobilization will be made in partial payments as follows:

1. When 5% of the original contract amount is earned from other bid items, 50% of the amount bid for mobilization, or 5% of the original contract amount, whichever is lesser, will be paid.
2. When 10% of the original contract amount is earned from other bid items, an additional 25% of the amount bid for mobilization, or 7-1/2% of the original contract amount, whichever is lesser, will be paid.
3. Upon final acceptance of all work on the project, the remainder of this pay item will be paid to Contractor in the final payment.

If the Contractor elects to demobilize during possible winter shutdown, no additional compensation will be given to re-mobilize. No adjustments shall be made in the contract price for mobilization due to changes in the original Base Bid amount.

Bit Item 2 – Site Preparation and Earthwork

Payment will be based on the Lump Sum (LS) price stated in the Bid Proposal. Measurement will be made on the basis of percent complete, as approved by the Engineer.

Work shall include, but not be limited to providing all materials, labor, equipment, and incidentals required to prepare the site and perform work necessary to construct Cells II-1 & II-2, and adjacent areas to final grade in accordance with the Drawings and Contract Documents. The work includes, but is not limited to the following:

- Surveying;
- Clearing, grubbing, and demolition of structures and obstructions (Drawing C-102);
- Dewatering existing “perched” ponds, removal of organics and muck, stabilizing with “shot rock”, and filling to grade as shown on the Drawings (payment for providing, installing, and compacting 2”-8” quarry spalls under berm areas shall be covered by Bid Item 7);
- Over excavation, and providing and installing the min. 12” imported subgrade fill (under Cells II-1 & II-2);
- Providing and installing the min. 6” liner foundation material on top of the prepared subgrade;
- All compaction;
- All excavation and embankment work;
- Traffic maintenance and coordination with the City regarding landfill operations and the USACE for removal of contaminated soils from the stockpile at Cells II-1 and II-2;
- All dewatering (in accordance with the SWPPP);
- Dewatering of the sump areas at both cells – until the liner and drain layer material is installed;
- Quality control testing for composite liner, pumping, and piping systems;
- Installation of the monitoring wells and underdrain system (Drawing C-209);
- Abandon three existing monitoring wells (Drawing C-102 and Appendix D);
- Installation of all fencing (Drawings C-210 & 211)
- All drainage piping and structures;

- All required grading of shot rock and installation of drainage facilities (Drawing C-230);
- Proper handling and removal of any undetonated explosives or explosives remnants in the shotrock material – refer to SC-10 of Supplementary Conditions and note on Drawing C-230;
- Hauling and stockpiling materials or surplus materials;
- Erosion and sediment control (for compliance with Contractor-prepared SWPPP);
- All other work not associated with the other pay items.

Bid Item 3 – Liner System

Payment will be based on the Lump Sum (LS) price stated in the Bid Proposal. Measurement will be made on the basis of percent complete, as approved by the Engineer.

Work shall include, but not be limited to providing all materials, labor, equipment, and incidentals required to install the liner systems for Cells II-1 and II-2 in accordance with the Drawings and Contract Documents. The work includes, but is not limited to the following:

- Surveying;
- Connection to the existing Cells 1 and 2 geomembrane liner systems along the east sides of Cells II-1 & II-2;
- Furnishing and installing the geosynthetic clay liner (GCL);
- Furnishing, installing, and testing the 60 mil HDPE geomembrane liner on top of the GCL;
- Furnishing and installing the 16 ounce cushioning geotextile on top of the HDPE;
- Construction of the sumps for installation of the sidehill leachate pump systems (for each cell);
- The two sump areas shall be dewatered until the liner and drain layer material are installed (see Bid Item 2);
- Installation of the drain layer material to the depths and grades in conformance with the Drawings.

Bid Item 4 – Leachate Collection and Conveyance System

Payment will be based on the Lump Sum (LS) price stated in the Bid Proposal. Measurement will be made on the basis of percent complete, as approved by the Engineer.

Work shall include, but not be limited to providing all materials, labor, equipment, and incidentals required to install the leachate collection and

conveyance system for Cells II-1 and II-2 in accordance with the Drawings and Contract Documents. The work includes, but is not limited to the following:

- Surveying;
- Furnishing and installing the four (4) leachate sidehill pumps, including: pumps, piping (perf. Sump, riser, discharge), riser enclosure, and bollards (Drawings S-201, M-201 to 203);
- Furnishing and installing all required electrical and controls;
- Furnishing and installing the 4” HDPE leachate force main – connect to the piping installed on a previous project (Drawings C-221 and 222);
- Furnishing and installing the storm drain systems as detailed on Drawing C-221;
- Furnishing and installing all required trenching, backfill, bedding, sheeting, shoring, bracing, and slope protection to install the piping and electrical conduit;
- Quality control testing.

Bid Item 5 – Over Excavation and Backfill

Payment will be based on the unit price per cubic yard (CY) stated in the Bid Proposal. Measurement will be on the basis of truck volume of fill, accepted and complete in-place. All compaction and testing will be incidental to the unit price. All work under this Bid Item shall be done at the sole discretion of the Engineer, and all work must be as directed by the Engineer, in writing. The intent of this Bid Item is to cover work outside the limits of work defined on the Contract Documents.

The measurement and payment will be full compensation for all materials, labor, equipment, and incidentals necessary to excavate, haul, place and compact or dispose of materials necessary to complete the construction of the project. For purposes of this Bid Item, the Contractor shall assure that all excavation will be hauled to waste, and all fill materials will be Import Fill.

Bid Item 6 – Site Restoration/Cleanup/Record Drawings

Payment will be based on the Lump Sum (LS) price stated in the Bid Proposal. Measurement will be made on the basis of percent complete, as approved by the Engineer. This payment shall be full compensation for all materials, labor, equipment, and incidentals necessary to cleanup, regrade, and generally restore the work site to a neat and clean condition. Also included are closure of the SWPPP and dewatering permit NOIs.

An as-built survey and preparation of Record Drawings is an element of work covered by this pay item. Refer to Subsection 1.5 for details of the as-built

survey and Record Drawings. When approved Record Drawings are received, the Owner will release payment of the final 20% of the bid amount for Bid Item Bid Item 6.

Bid Item 7 – Provide, Install, and Compact 2”-8” Quarry Spalls

Payment will be based on the unit price per ton stated in the Bid Proposal. Measurement will be on the basis of approved scale tickets submitted to the Engineer. The unit price shall include placing and compacting the quarry spalls under landfill cell berm areas as directed by the Engineer, as shown on the Drawings and defined in the specifications. All compaction and providing the 16 oz. non-woven geotextile (to separate the quarry spalls from the shot rock) shall be incidental to the unit price.

The measurement and payment will be full compensation for all materials, labor, equipment, and incidentals necessary to provide, haul, place, compact, and install the geofabric separation. All quarry spalls shall be Import Fill.

END OF SECTION

SECTION 01300 – PROJECT DATA SUBMITTALS

PART 1 - GENERAL

1.1 DESCRIPTION

This section describes review procedures for Contractor submittals required by the Contract.

PART 2 - CONTRACTOR'S RESPONSIBILITIES

2.1 COORDINATION

- A. The Contractor shall coordinate submittals with the work so that work will not be delayed. Submittals shall be sufficiently timely to allow normal processing time. The Engineer and Owner are under no obligation to expedite processing due to the Contractor's failure to anticipate submittal preparation and submittal time in his schedule.
- B. The Contractor shall coordinate and schedule different categories of submittals, so that one will not be delayed for lack of coordination with another. No extension of time will be allowed because of failure to properly schedule submittals. The Contractor shall not proceed with work related to a submittal until the submittal process is complete. This requires that submittals for review and comment shall be returned to the Contractor stamped "No Exceptions Taken" or "Make Corrections Noted".
- C. The Contractor shall certify on each submittal document that he has reviewed the submittal, verified field conditions, and complied with the Contract Documents. Submittals provided to the Engineer that are not stamped as being reviewed by the Contractor will be returned without review.
- D. The Contractor may authorize in writing a material or equipment supplier to deal directly with the Engineer or with the Owner with regards to a submittal. These dealings shall be limited to contract interpretations to clarify and expedite the work.

2.2 REQUESTS FOR SUBSTITUTION

- A. Requests for substitution for equipment specified by manufacturer or manufacturer's model number shall be in writing and shall be accompanied with sufficient information to permit the Engineer to identify the nature and scope of the request. Information to be provided, along with the requests for substitution, shall include:
 - 1. All submittal information required for the specified equipment, including all deviations from the specified requirements necessitated by the proposed substitution.

2. Materials of construction, including material specifications and references.
3. Performance data, including performance curves and guaranteed power consumptions, over the range of specified operating conditions.
4. Dimensional drawings, showing required access and clearances, including any changes to the work required to accommodate the proposed substitution.
5. Piping and Process and Instrumentation Drawings, produced in the project format and with project-specific symbols, along with control descriptions, when controls are part of the proposed substitution.
6. Piping and Process and Instrumentation Drawings, produced in project format and with project-specific symbols, with all required modifications clearly highlighted when controls specified in the Contract Documents require modifications to accommodate the proposed substitution.
7. Information and performance characteristics for all system components and ancillary devices to be furnished as a part of the proposed substitution.
8. A list of installations of the proposed substitution indicating application, location, owner and date of first issuance.
 - a. Coordination information, including a list of changes or modifications needed to other parts of the work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
 - b. Detailed comparison of significant qualities of proposed substitution with those of the work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 - c. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - d. Samples, where applicable or requested.
 - e. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
 - f. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - g. Research/evaluation reports evidencing compliance with building code in effect for project, from a model code organization acceptable to authorities having jurisdiction.
 - h. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the work including effect on the overall contract time. If specified product or method of construction cannot be provided within the contract time, include letter from manufacturer, on

- manufacturer's letterhead, stating lack of availability or delays in delivery.
- i. Cost information, including a proposal of change, if any, in the contract sum.
 - j. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
 - k. Contractor's waiver of rights to additional payment or time that may be subsequently become necessary because of failure of proposed substitution to produce indicated results.
- B. Upon receipt of written application for substitution from the Contractor, including the information specified above, the Engineer will estimate the cost of evaluating the request and present the estimate to the Contractor. The Contractor is advised that the estimate is based upon the best information available to the Engineer at the time; however, the actual cost, based on time and expense, will be documented and applied in the final analysis of the substitution request. If the Contractor wishes to proceed with the request, he shall advise the Engineer in writing and submit sufficient additional information as may be requested by the Engineer. No evaluation will take place until such time as the Contractor has agreed to the estimate in writing and has authorized the Engineer to deduct the cost of the evaluation from monthly progress payments due the Contractor.
- C. The Engineer will notify the Contractor of acceptance or rejection of proposed substitutions within 30 days.

The review by the Engineer of the proposed Substitution Request is only for conformance with the general design concept of the project, and does not extend to consideration of specific dimensions, structural integrity, safety, detailed installation and construction requirements, or any other obligation of the Contractor. Any action shown is subject to the requirements of the Contract Documents. The review of project data by the Engineer shall not relieve the Contractor from his/her obligation to perform fully all contract requirements, nor shall such review give rise to any right of action or suit in favor of the Contractor or third persons against the Engineer or the Owner

Form of Acceptance will be processed by issuance of a contract Change Order.

PART 3 - TRANSMITTAL PROCEDURES

3.1 GENERAL

- A. Unless otherwise specified, submittals shall be accompanied by transmittal forms to be provided by Engineer. A separate form shall be used for each specific item, class of material, equipment, and items specified in separate,

discrete sections, for which the submittal is required. Submittal documents common to more than one piece of equipment shall be identified with all the appropriate equipment numbers. Submittals for various items shall be made with a single form when the items taken together constitute a manufacturer's package or are so functionally related that expediency indicates checking or review of the group or package as a whole.

- B. A unique number, sequentially assigned, shall be noted on the transmittal form accompanying each item submitted. Original submittal numbers shall have the following format: "XXX," where "XXX" is the sequential number assigned by the Contractor. Resubmittals shall have the following format: "XXX-Y," where "XXX" is the originally assigned submittal number and "Y" is a sequential letter assigned for resubmittals, i.e., A, B, or C being the 1st, 2nd, and 3rd resubmittals, respectively. Submittal 25B, for example, is the second resubmittal of submittal 25.
- C. Deviation from Contract: If the Contractor proposes to provide material, equipment, or method of work which deviates from the project manual, he shall indicate so under "deviations" on the transmittal form accompanying the submittal copies. Contractor may be required to submit such deviations per the requirements of subsection 2.2 Requests for Substitutions.
- D. Submittal Completeness: Submittals which do not have all the information required to be submitted, including deviations, are not acceptable and will be returned without review.

3.2 LIMITATIONS ON REVIEWS

- A. The Contractor's submittals for equipment and materials shall meet or exceed the requirements of the specifications. Accordingly, it is considered reasonable that the Contractor provide project data which are complete and acceptable, in the judgment of the Engineer, by the second submission of specific project data. The Owner reserves the right to and will withhold such amount from payments due to the Contractor to cover the cost of review by the Engineer of third and subsequent submittal submissions.

PART 4 - REVIEW PROCEDURE

4.1 GENERAL

- A. The review procedure is based on the Contractor's guarantee that all features and characteristics not requiring submittals conform as specified. Review shall not extend to means, methods, techniques, sequences or procedures of construction, or to verifying quantities, dimensions, weights or gauges, or fabrication processes (except where specifically indicated or required by the Contract Documents) or to safety precautions or programs incident thereto. Review of a separate item, as such, will not indicate approval of the assembly in which the item functions.

- B. When the Contract Documents require a submittal, it shall be submitted to the Engineer in the format and quantity specified in the Specifications. The Engineer will compile review comments by the Owner and Subconsultants before returning submittal comments to the Contractor. Building Official reviews will be provided separately from the Engineer's review comments.
- C. The Contractor should allow 14 calendar days for each submittal or resubmittal review. Processing time may be extended in the case of more complicated submittals.
- D. In the case of Deferred Submittals, review time will be extended due to the need to include review by the Building Official. The Owner and Engineer have no control over the amount of time the Building Official will take, however a turnaround time of about 3 weeks is anticipated after completion of the Engineer's review. Deferred submittals will not be forwarded to the Building official until after completion of review by the Engineer.
- E. The Engineer shall review and comment on submittals and return comments to the Contractor in electronic form (pdf file), unless physical paper size or submittal type prohibits legible scanning and reprinting. Upon final approval, one hard copy of the submittal will be returned to the Contractor. The Contractor shall be responsible for making any additional copies for his own use at his own expense.

4.2 SUBMITTAL FORMAT AND PROCEDURES

- A. Submittals may be transmitted electronically through email or other means provided they are in a commonly accepted file format (Adobe pdf) and no larger than 11 x 17. File sizes that are too large to be sent by email shall be transmitted another way. It shall be up to the Contractor to determine another means of transmitting such files.
- B. Submittals transmitted electronically will be logged the day received if sent during normal business hours. If electronic submission takes place after hours, or over the weekend, the submittal will be logged the next business day.
- C. Submittals intended to be transmitted electronically shall be reviewed by the Contractor prior to sending to the Engineer per subsection 2.1.C. Submission of product data straight from the manufacture's website or online catalog, with no notation of selected model, options or accessories will be returned, un-reviewed by the Engineer. Contractor review can be noted by digital stamp or scan of a red-line mark up.
- D. Large format submittals (physical paper size greater than 11" x 17") or bound product documentation not readily scanned shall have six (6) hardcopies submitted to the Engineer. The Engineer will review and return two (2) hardcopies to the Contractor in the same time duration as above. The submittal will be logged the day it is received by the Engineer.

4.3 SUBMITTAL ACTION

- A. The returned submittal shall indicate one of the following actions:
1. If the review indicates that the material, equipment or work method complies with the project manual, submittal copies will be marked “No Exceptions Taken.” In this event, the Contractor may begin to implement the work method or incorporate the material or equipment covered by the submittal.
 2. If the review indicates limited corrections are required, copies will be marked “Make Corrections Noted.” The Contractor may begin implementing the work method or incorporating the material and equipment covered by the submittal in accordance with the noted corrections. Where submittal information will be incorporated in O&M data, a final corrected copy shall be provided by the Contractor.
 3. If the review reveals that the submittal is insufficient or contains incorrect data, copies will be marked “Revise and Resubmit. Except at his own risk, the Contractor shall not undertake work covered by the submittal until it has been revised, resubmitted and returned marked either “No Exceptions Taken” or “Make Corrections Noted.”
 4. Informational submittals not subject to submittal review procedures shall be returned marked “Reference Only”.
 5. Submittals received by the Engineer that are not required by the Specifications or have no bearing on the project will be marked “Submittal Not Required – No Action Taken” and returned without review by the Engineer.

PART 5 - EFFECT OF REVIEW OF CONTRACTOR’S SUBMITTALS

5.1 GENERAL

- A. The review by the Engineer of Shop Drawings, Project Data, and/or Samples is only for conformance with the general design concept of the project, and does not extend to consideration of specific dimensions, structural integrity, safety, detailed installation and construction requirements, or any other obligation of the Contractor. Any action shown is subject to the requirements of the Contract Documents. The review of project data by the Engineer shall not relieve the Contractor from his/her obligation to perform fully all contract requirements, nor shall such review give rise to any right of action or suit in favor of the Contractor or third persons against the Engineer or the Owner.
- B. Review of shop drawings, methods of work, or information regarding materials or equipment the Contractor proposes to provide, shall not relieve the Contractor of his responsibility for errors therein and shall not be regarded as an assumption of risks or liability by the Engineer or the Owner, or by any officer or employee thereof, and the Contractor shall have no claim under the contract on account of the failure, or partial failure, of the method of work, material, or equipment so reviewed. A mark of “No Exceptions Taken” or

“Make Corrections Noted” shall mean that the Owner has no objection to the Contractor, upon his own responsibility, using the plan or method of work proposed, or providing the materials or equipment proposed.

PART 6 - SUBMITTAL LOG

6.1 GENERAL

- A. The Engineer shall maintain a matrix-format Submittal Log which indicates the status of all submittals. Resubmittals shall be logged as separate entries on the log. The log shall be distributed to the Owner and Contractor weekly with the following information:
1. Date of submittal.
 2. Date received by the Engineer.
 3. Date received by the Owner (if applicable)
 4. For submittals requiring review by a Subconsultant or the Building Official:
 - a. Date transmitted by Engineer to Subconsultant or Building Official
 - b. Identification of reviewing Subconsultant or Building Official
 - c. Date of receipt of review comments by Engineer
 5. Date compiled review comments transmitted to Owner for comment.
 6. Date of transmittal of review comments to Contractor by Engineer or Owner.
 7. Action taken (No Exceptions Taken, Rejected, etc.)
 8. Status (Processing Complete, Action by Engineer Pending, etc.)

PART 7 - COMPILED SUBMITTALS

7.1 GENERAL

Upon final approval of all submittals, the Contractor shall provide the Owner with one, bound hardcopy set and one electronic copy of all approved submittals. The submittal compilation shall be organized by specification section number with a table of contents, section tabs, etc. The electronic copy shall be a cohesive Adobe “pdf” document that is bookmarked.

END OF SECTION

SECTION 02072 - GEOTEXTILES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Manufacturing and installation of geotextiles for separation, cushioning, and other applications as shown on the Drawings.

- B. Referenced Standards: This section incorporates by reference the latest revision of the following documents. It is part of this section as specified and modified. In case of conflict between the requirements of this section and that of the listed documents, the requirements of this section shall prevail:
 - 1. American Society for Testing and Materials (ASTM):
 - a. D3786: Standard Test Method for Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabrics - Diaphragm Bursting Strength Tester Method.
 - b. D4355: Standard Test Method for Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus).
 - c. D4439: Standard Terminology for Geosynthetics.
 - d. D4533: Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
 - e. D4632: Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
 - f. D4751: Standard Test Method for Determining Apparent Opening Size of a Geotextile.
 - g. D4833: Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products.
 - h. D4873: Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls.
 - i. D5261: Standard Test Method for Measuring Mass per Unit Area of Geotextiles.
 - j. D5321: Standard Test Method for Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and Geosynthetic Friction by the Direct Shear Method.

1.2 DEFINITIONS

- A. Definitions shall be in accordance with ASTM D4439, unless otherwise indicated.

- B. Construction Quality Control (CQC): Refers to those activities performed by the Contractor (including those parties responsible for the manufacture, supply, fabrication, delivery, and installation) to demonstrate and / or quantify the characteristics of the product.

- C. Construction Quality Assurance (CQA): Refers to those activities (including but not limited to observations, verifications, audits, independent testing, QC data review, and evaluation) performed by the Engineer.
- D. Installer: The party responsible for transporting, storing, handling, deploying, installing, and protecting the geotextile.
- E. Manufacturer: The party responsible for the production of the geotextile in accordance with this Specification.
- F. Minimum Average Roll Value (MARV): Minimum of a series of average roll values representative of geosynthetic material furnished.
- G. Overlap: Distance measured perpendicular from overlapping edge of one sheet to underlying edge of adjacent sheet.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01300 – Project Data Submittals.
- B. Prior to shipping geotextiles to the site, submit three copies of the following:
 - 1. Manufacturer’s material specifications, product literature, and sample measuring not less than 6 inches square for the proposed geotextile.
 - 2. Manufacturer’s written certification that the proposed geotextile has the material property values required by this Specification.
 - 3. Manufacturer source quality control testing results.
 - 4. Manufacturer guarantee that the geotextile is free of needles.
 - 5. Written procedures for storing, handling, installing, repairing and seaming the geotextile.
- C. Prior to placement of the geotextile, the Contractor shall submit resume(s) of the individual(s) or subcontractor(s) who will perform the CQC activities. The resume(s) shall demonstrate that the individual(s) or subcontractor(s) are suitably qualified to perform CQC activities.

1.4 QUALITY ASSURANCE AND QUALITY CONTROL

- A. Perform QC activities in accordance with Article 12 – General Conditions.
- B. The Contractor shall engage and pay for the services of qualified staff or a qualified subcontractor to perform CQC activities. Subcontracted organizations shall be commercial entities normally engaged in QA/QC services for waste disposal facilities. Individuals, whether on the Contractor’s or subcontractor’s staff, shall have a minimum of 1 year of directly applicable experience pertinent to the requirements of this section.
- C. The results of each day’s CQC testing and inspection shall be submitted to the Engineer before the start of installation on the next working day.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Delivery, storage, and handling of the geotextile shall conform to ASTM D4873.
- B. Geotextile shall be supplied in rolls wrapped individually in opaque, dust-proof protective covers.
- C. Each roll shall be labeled with the lot number, roll number, and other information necessary to identify it for inventory and CQC and CQA testing.
- D. Upon delivery at the site, the Contractor and the Engineer shall inspect the surfaces of all rolls for defects and for damage. This inspection shall be conducted without unrolling rolls unless defects or damages are found or suspected. The Engineer will determine:
 - 1. Rolls, or portions thereof, which should be rejected and removed from the site because they have severe flaws.
 - 2. Rolls that are not properly labeled. No unlabelled rolls shall be used for any application. Unlabelled rolls shall be removed from the site and replaced at the Contractor's expense.
- E. Immediately repair any damaged protective covering. Preserve integrity and legibility of geotextile roll labels.
- F. Do not store products directly on the ground. Protect the geotextile from ultraviolet light exposure, precipitation, "vectors", inundation, mud, dirt, dust and other damaging conditions.

PART 2 - PRODUCTS

2.1 GEOTEXTILES

- A. Types: Geotextile types as listed on the Drawings shall, as a minimum, have the following nominal mass per unit area:
 - 1. Cushioning: 16 oz/yd²
 - 2. Separation: 6 oz/yd²
- B. Material:
 - 1. Separation Geotextile shall be non-woven, pervious sheet of polyester, polypropylene, polyethylene, or polyamide fibers oriented into a stable network so that the fibers retain their relative position with respect to each other during handling, placement and long-term service. Geotextiles shall be composed of continuous or staple fibers held together through needle-punching. The geotextile products shall not be heat burnished.
 - 2. Cushioning Geotextile shall be non-woven, needle-punched polypropylene.

3. All geotextiles shall be free of needles and other potentially harmful objects.

C. Properties:

1. Geotextiles shall have the minimum properties shown in Table 1:

TABLE 1. REQUIRED GEOTEXTILE PROPERTIES				
PROPERTY	UNIT	VALUE (A)		TEST METHOD
		SEPARATION	CUSHIONING	
Mass/Unit Area	oz/yd ²	6 ^(b)	16 ^(b)	ASTM D5261
Apparent Opening Size ^(b)	U.S. Sieve	70-100	---	ASTM D4751
Grab Strength	lb	140	350	ASTM D4632
Trapezoidal Tear Strength	lb	70	125	ASTM D4533
Puncture Strength	lb	75	220	ASTM D4833
Burst Strength	psi	---	700	ASTM D3786
UV Resistance (500 hours)	% strength retained	70	70	ASTM D4355

- Notes: (a) All values are minimum average roll values, except as noted.
 (b) Nominal values.

2.2 MANUFACTURER'S SOURCE QUALITY CONTROL

- A. The manufacturer shall perform source quality control testing on the geotextile at a minimum frequency of once per lot or once every 100,000 square feet, whichever results in the greater number of tests.
- B. All test results shall conform to the manufacturer's published material properties and the requirements of this section. Material which does not exhibit passing results shall be rejected.
- C. The Contractor shall submit the geotextile manufacturer's source quality certification for all rolls of geotextile shipped to the site. Each quality control certificate shall include roll identification numbers and results of quality control tests. The quality control certificate shall be signed by a responsible party employed by the manufacturer, such as the production manager.

2.3 LABELING

- A. Mark or tag all geotextile rolls with the following information:
 1. Manufacturer's name.
 2. Product identification.
 3. Lot number.
 4. Roll number.
 5. Roll dimensions.
- B. Mark special handling requirements on rolls.

PART 3 - EXECUTION

3.1 GENERAL

- A. Install geotextiles at the locations, lines, and grades shown on the Drawings. All geotextiles shall be installed in accordance with these Specifications.
- B. Materials and Work which fail to meet the requirements of these Specifications shall be removed and disposed of at the Contractor's expense.

3.2 DEPLOYMENT

- A. Prior to deployment of the geotextile, examine the underlying surface for conformance with the pertinent section of these Specifications and for anything that might damage the geotextile.
- B. In slope areas, deploy geotextile with the roll length running up and down the slope; shingle adjacent panels similar to C below.
- C. In trenches and ditches, "shingle" adjacent panels in the down-slope direction (i.e., the up-slope panel shall be above the down-slope panel in the overlapped area). In trenches, place geotextile with sufficient slack to fully contact the trench bottom and sides when trench is backfilled.
- D. In flat areas, overlap adjacent panels of geotextile a minimum of 12 inches or as recommended by the geotextile manufacturer for the seaming method used.
- E. In trenches and ditches, overlap adjacent panels of geotextile a minimum of 12 inches.
- F. Handle all geotextiles in such a manner as to ensure that they are not damaged. Do not drag the geotextile across textured geomembrane. If necessary, use a smooth slip sheet under the textile. Position the geotextile after deployment and remove the slip sheet, if used.
- G. Place geotextiles in a manner that prevents folds and wrinkles. Folds or wrinkles shall be pulled smooth prior to seaming.
- H. In the presence of wind, all exposed geotextiles shall be weighted with sandbags or equivalent. Sandbags shall be installed during placement and shall remain until replaced with cover material.
- I. Geotextiles shall be cut using an approved geotextile cutter only. Special care shall be taken to protect underlying geosynthetic materials from damage during cutting.
- J. During geotextile placement, care shall be taken not to entrap stones, excessive dust, or moisture that could damage the adjacent geomembrane (if present), clog drains or filters, or hamper subsequent seaming.

- K. After installation and immediately prior to placing overlying materials, the geotextile shall be examined over its entire surface to ensure that no potentially harmful foreign objects, such as needles, are present. Any foreign objects encountered shall be removed, or the geotextile shall be replaced.
- L. If light colored geotextile is used, precautions shall be taken against “snowblindness” of personnel.
- M. After deployment, all geotextile shall be covered to limit exposure to ultraviolet (UV) radiation (sunlight) within a maximum period of 4 weeks.

3.3 SEAMING

- A. All geotextiles shall be continuously sewn (i.e., spot sewing is not allowed). Alternatively, single or double wedge fusion welding will be acceptable. The CQC requirements for welding will be the same as for sewing. Leister welding (spot or continuous) will not be accepted as a replacement for sewing.
- B. Areas to be seamed shall be clean and free of foreign material.
- C. Sewing shall be done using polymeric thread with chemical resistance properties equal to or exceeding those of the geotextile.
- D. All sewing shall be done using a sewing machine which creates a chain stitch. When entering and exiting a seam, the stitches shall be overlapped to prevent unraveling.
- E. In ditches and trenches, seams may be overlapped only (i.e., not welded or sewn), provided that backfilling, lining, or other subsequent construction activities do not displace the geotextile to the extent that adjacent panels no longer overlap.

3.4 PROTECTION

- A. When placing soil or other cover materials over geotextile, the Contractor shall ensure that:
 - 1. The geotextile is not damaged through puncture, tear, or any other mechanism.
 - 2. There is no slippage of the geotextile on underlying layers.
 - 3. No excessive tensile stresses are generated in the geotextile.
 - 4. Any damage to the geotextile shall be repaired at the Contractor’s sole expense.
- B. Do not operate machinery directly on the geotextile. If the geotextile is covered with less than a 2 FT thickness of soil, no equipment with a ground pressure greater than 5 psi shall operate within 2 FT of the area underlain by the geotextile.

3.5 REPAIRS

- A. Remove any soil or other material which may have penetrated the torn geotextile, and repair any damage to other materials or layers.
- B. Place a patch of the same geotextile having dimensions at least 12 inches greater than the tear or hole in all directions.
- C. Double seam the patch into place with the seams $\frac{1}{4}$ IN to $\frac{3}{4}$ IN apart and no closer than 1 IN to any edge.

3.6 ACCEPTANCE

- A. The Contractor shall retain all ownership and responsibility for geotextile until acceptance by the Engineer.
- B. The geotextile will be accepted when:
 - 1. The installation is complete.
 - 2. Conformance test results verify that the requirements of the Specification have been satisfied.
 - 3. Documentation is complete.
 - 4. Verification of the adequacy of all seams and repairs is complete.
 - 5. The required written certification documents have been received by the Engineer.
 - 6. The drain layer material has been installed on the 16 oz/ft² cushioning material.

END OF SECTION

SECTION 02076 - GEOSYNTHETIC CLAY LINER

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Manufacturing and installing of Geosynthetic Clay Liner (GCL) used in the liner system as shown on the Drawings.
- B. Referenced Standards: This section incorporates by reference the latest revision of the following documents. It is part of this section as specified and modified. In case of conflict between the requirements of this section and that of the listed documents, the requirements of this section shall prevail.
 - 1. American Society for Testing and Materials (ASTM):
 - a. D4439: Standard Terminology for Geosynthetics.
 - b. D4873: Standard Guide for Identification, Storage, of Geosynthetic Rolls and Samples.
 - c. D5321: Standard Test Method for Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and Geosynthetic Friction by the Direct Shear Method.
 - d. D5887: Standard Test Method for Measurement of Index Flux Through Saturated Geosynthetic Clay Liner Specimens Using a Flexible Wall Permeameter.
 - e. D5890: Standard Test Method for Swell Index of Clay Mineral Component of Geosynthetic Clay Liners.
 - f. D5993: Standard Test Method for Measuring Mass Per Unit of Geosynthetic Clay Liners.

1.2 DEFINITIONS

- A. Definitions shall be in accordance with ASTM D4439, unless otherwise indicated.
- B. Construction Quality Control (CQC): Refers to those activities performed by the Contractor (including those parties responsible for the manufacture, supply, fabrication, delivery, and installation) to demonstrate and/or quantify the characteristics of the product.
- C. Construction Quality Assurance (CQA): Refers to those activities (including but not limited to observations, verifications, audits, independent testing, QC data review, and evaluation) performed by the Engineer.
- D. Installer: The party responsible for transporting, storing, handling, deploying, installing, and protecting the GCL.
- E. Manufacturer: The party responsible for the production of the GCL in accordance with this Specification.

- F. Minimum Average Roll Value (MARV): Minimum of a series of average roll values representative of geosynthetic material furnished.
- G. Overlap: Distance measured perpendicular from overlapping edge of one sheet to underlying edge of adjacent sheet.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01300 – Project Data Submittals.
- B. Prior to shipping the GCL to the site, submit the following:
 - 1. Manufacturer’s material specifications, product literature, and sample measuring not less than 6 inches square for the proposed GCL.
 - 2. Manufacturer’s written certification that:
 - a. The proposed GCL has the material property values required by this Specification.
 - b. The GCL manufacturer has continuously inspected the GCL for the presence of needles and found GCL to be needle-free.
 - c. The loose bentonite for seaming consists of the same natural sodium bentonite as the GCL.
 - 3. Manufacturer source quality control testing results.
 - 4. Written procedures for storing, handling, installing, repairing and seaming the GCL.
- C. Prior to placement of the GCL, the Contractor shall submit resume(s) of the individual(s) or subcontractor(s) who will perform the CQC activities. The resume(s) shall demonstrate that the individual(s) or subcontractor(s) are suitably qualified to perform CQC activities.

1.4 QUALITY ASSURANCE AND QUALITY CONTROL

- A. Perform QC activities in accordance with Article 12 – General Conditions.
- B. The Contractor shall engage and pay for the services of qualified staff or a qualified subcontractor to perform CQC activities. Subcontracted organizations shall be commercial entities normally engaged in QA/QC services for waste disposal facilities. Individuals, whether on the Contractor’s or subcontractor’s staff, shall have a minimum of 1 year of directly applicable experience pertinent to the requirements of this section.
- C. The results of each day’s CQC testing and inspection shall be submitted to the Engineer before the start of installation on the next working day.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Delivery, storage, and handling of the GCL shall conform to ASTM D4873.
- B. GCL shall be supplied in rolls wrapped individually in impermeable and relatively opaque protective covers.

- C. Each roll shall be labeled with the lot number, roll number, and other information necessary to identify it for inventory and CQC and CQA testing.
- D. Upon delivery at the site, the Contractor and the Engineer shall inspect the surfaces of all rolls for defects and damage. This inspection shall be conducted without unrolling rolls unless defects or damages are found or suspected. The Engineer will determine:
 - 1. Rolls, or portions thereof, which should be rejected and removed from the site because they have severe flaws.
 - 2. Rolls that are not properly labeled. No unlabelled rolls shall be used for any application. Unlabelled rolls shall be removed from the site and replaced at the Contractor's expense.
- E. Immediately repair any damaged protective covering. Preserve integrity and legibility of GCL roll labels.
- F. Store and protect GCL from dirt, water, ultraviolet light exposure, vandalism, and other sources of damage.

PART 2 - PRODUCTS

2.1 GEOSYNTHETIC CLAY LINER (GCL)

- A. The GCL shall be Bentomat DN or approved alternate.
- B. The bentonite in the GCL shall be a sodium montmorillonite clay with a minimum free swell value of 20.
- C. The finished GCL shall have a minimum bentonite weight of 0.75 lbs/ft² exclusive of glue weight.
- D. The finished GCL shall have a maximum hydraulic conductivity of 5×10^{-9} cm/sec under a gradient of 1.
- E. The GCL shall be manufactured so that the bentonite is stabilized by needle punching through the top and bottom layers of geotextile to enhance the internal shear strength of the GCL and to maintain the integrity of the GCL under hydration.
- F. The GCL shall be manufactured so that the bentonite is continuously contained throughout the GCL and so that no displacement of the bentonite occurs when the material is unrolled, moved, cut, torn, or punctured.
- G. The encapsulating geotextiles used in the GCL shall be non-woven, needle-punched polypropylene with a minimum nominal weight of 6 oz/yd².

2.2 MANUFACTURER SOURCE QUALITY CONTROL

- A. The GCL manufacturer shall perform source quality control testing to confirm the manufacturer's published material characteristics and demonstrate compliance with this Section. Testing shall be performed at a minimum frequency of once per lot or once every 100,000 square feet, whichever results in the greater number of tests.
- B. The Contractor shall provide the GCL manufacturer's source quality certification for all rolls of GCL shipped to the site. Each quality control certificate shall include roll identification numbers and results of quality control tests. The quality control certificate shall be signed by a responsible party employed by the manufacturer, such as the production manager.
- C. The GCL manufacturer shall examine entire GCL surface using a metal detector or other suitable method to verify that no needles or other sharp objects are present. The manufacturer shall certify in writing that the GCL surfaces are needle-free.

2.3 LABELING

- A. Each GCL roll shall be marked or tagged with the following information:
 - 1. Manufacturer's name.
 - 2. Product identification.
 - 3. Lot number.
 - 4. Roll dimensions.
 - 5. Roll weight.
- B. Mark special handling requirements on rolls.

2.4 ACCESSORY BENTONITE

- A. Bentonite for seaming shall be in powder or granular form, and shall be equivalent to the bentonite used in the manufacture of the GCL. The GCL manufacturer shall recommend the accessory bentonite.

PART 3 - EXECUTION

3.1 GENERAL

- A. Install GCLs at the locations, lines, and grades shown on the Drawings. All GCLs shall be installed in accordance with these Specifications.
- B. Materials and Work which fail to meet the requirements of these Specifications shall be removed and disposed of at the Contractor's expense.

3.2 HANDLING AND PLACEMENT

- A. The Contractor shall handle and deploy all GCLs in such a manner as to ensure that they are not damaged.

3.3 SUBGRADE PREPARATION

- A. Soil subgrades shall be compacted to form a firm, unyielding surface.
- B. The subgrade surface shall be free of debris, organic material, frozen soil, ice, rocks, and other deleterious material.
- C. The subgrade surface shall be free of standing water or excessive moisture.
- D. The subgrade surface shall be smooth and free of protrusions, ruts, and other irregularities greater than ½ IN high.
- E. No GCL shall be deployed until the subgrade surface has been reviewed by the Engineer.

3.4 DEPLOYMENT

- A. GCL shall be deployed so that seams run up and down (not across) the slope.
- B. Adjacent panels of GCL shall be overlapped 6 to 12 inches in accordance with the manufacturer's recommendations.
- C. Any wrinkles shall be removed by adjusting and smoothing the GCL after placement.
- D. GCL shall not be deployed during precipitation or in the presence of moisture, ponded water, snow, or in other situations that could cause premature hydration of the bentonite. Any GCL that hydrates prematurely shall be removed and replaced at the Contractor's expense.
- E. Deploy only that area of GCL which can be covered during the same day, unless otherwise approved by the Engineer.
- F. Weight the GCL with sandbags or equivalent as necessary to prevent wind uplift.
- G. Cut GCL with a geotextile cutter (hook blade), scissors, or other approved device. Protect adjacent materials from damage due to GCL cutting.
- H. Do not entrap stones, debris, or other deleterious material within seams or beneath the GCL.

3.5 SEAMING

- A. Contacting seam surfaces shall be clean and free of dirt or native soil with all edges pulled tight to maximize contact and to smooth out any wrinkles or creases.

- B. Loose bentonite shall be applied at the minimum rate recommended by the GCL manufacturer. In no case shall the minimum rate be less than ¼ pound per linear foot along all seams or overlaps.

3.6 PROTECTION

- A. Care shall be taken during placement of material above the GCL to prevent slippage of the GCL, the development of tensile stresses in the GCL, or any other damage. Any damage to the GCL shall be repaired at the Contractor's sole expense.
- B. Do not operate machinery directly on the GCL. If the GCL is covered with less than 2 FT of soil, no equipment with a ground pressure of greater than 5 pounds per square inch shall operate within 2 FT of the area underlain by the GCL.

3.7 REPAIRS

- A. Remove damaged or hydrated areas of GCL using an approved cutter.
- B. Place a patch of the same material extending at least 1 FT in all directions beyond the flaw or damaged area.
- C. Seam around the perimeter of the patch per the requirements for initial seaming as described in this section.

3.8 ACCEPTANCE

- A. The Contractor shall retain all ownership and responsibility for the GCL until final acceptance of the Project by the Engineer.
- B. The Engineer will accept the GCL when:
 - 1. The installation is complete.
 - 2. Conformance test results verify that the requirements of the Specification have been satisfied.
 - 3. The GCL must be covered by the geomembrane, the geotextile cushion, and the 24-inch drain layer. This should be done as soon as is possible.
 - 4. Documentation is complete.
 - 5. Verification of the adequacy of all seams and repairs is complete.
 - 6. The required written certification documents have been received by the Engineer.

END OF SECTION

SECTION 02078 - HDPE GEOMEMBRANE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Manufacture, storage, delivery, and installation of high density polyethylene (HDPE) geomembrane materials as shown in the drawings or as directed by the Engineer.

1.2 REFERENCES

- A. This section incorporates by reference the latest revision of the following documents. It is part of this section as specified and modified. In case of conflict between the requirements of this section and that of the listed documents, the requirements of this section shall prevail.
- B. American Society for Testing and Materials (ASTM):
1. D638: Standard Test Method for Tensile Properties of Plastics.
 2. D1004: Standard Test Method for Initial Tear Resistance of Plastic Film and Sheeting.
 3. D1238: Standard Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer.
 4. D1505: Standard Test Method for Density of Plastics by the Density-Gradient Technique.
 5. D1603: Standard Test Method for Carbon Black In Olefin Plastics.
 6. D3895: Standard Test Method for Oxidative-Induction Time of Polyolefins by Differential Scanning Calorimetry.
 7. D4218: Determination of Carbon Black Content in Polyethylene Compounds by the Muffle-Furnace Technique.
 8. D4439: Standard Terminology for Geosynthetics.
 9. D4833: Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products.
 10. D4873: Standard Guide for Identification, Storage, and Handling for Geosynthetic Rolls.
 11. D5199: Test Method for Measuring Nominal Thickness of Geotextiles and Geomembranes.
 12. D5596: Standard Test Method for Microscopic Evaluation of the Dispersion of Carbon Black in Polyolefin Geosynthetics.
 13. D5641: Standard Practice for Geomembrane Seam Evaluation by Vacuum Chamber.
 14. D5885: Standard Test Method for Oxidative Induction Time of Polyolefin Geosynthetics by High-Pressure Differential Scanning Calorimetry.

15. D6392: Standard Test Method for Determining the Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods.
- C. Geosynthetic Research Institute (GRI):
 1. GM6: Pressurized Air Channel Test for Dual Seamed Geomembranes.
 2. GM11: Accelerated Weathering of Geomembranes using a Fluorescent UVA-Condensation Exposure Device.
 3. GM13: Test Properties, Testing Frequency and Recommended Warranty for High Density Polyethylene (HDPE) Smooth and Textured Geomembranes.
 4. GM14: Selecting Variable Intervals for Taking Geomembrane Destructive Seam Samples Using the Method of Attributes.

1.3 DEFINITIONS

- A. Definitions shall be in accordance with ASTM D4439, unless otherwise indicated.
- B. Batch: Refers to the quantity of resin, usually the capacity of one railcar, used in the manufacture of HDPE geomembrane sheet. The finished sheet shall be identified by a roll number corresponding to the particular batch of resin used.
- C. Bridging: When the geomembrane becomes suspended over the subgrade due to expansion or contraction of the material or poor installation.
- D. Construction Quality Control (CQC): Refers to those activities performed by the Contractor (including those parties responsible for the manufacture, supply, fabrication, delivery, and installation) to demonstrate and / or quantify the characteristics of the product.
- E. Construction Quality Assurance (CQA): Refers to those activities (including but not limited to observations, verifications, audits, testing, QC data review, and evaluation) performed by the Engineer.
- F. Extrudate: The molten polymer that is produced from an extruder during extrusion seaming. The polymer is initially in the form of a ribbon rod, bead, or pellets.
- G. Geomembrane Subgrade: The surface upon which the geomembrane is placed.
- H. Installer: The party responsible for transporting, storing, handling, deploying, installing, and protecting the geomembrane.
- I. Manufacturer: The party responsible for the production of the geomembrane in accordance with this Specification.

- J. Master Welder: The individual to whom the installer delegates responsibility for oversight of geomembrane seaming operations.
- K. Overlap: Distance measured perpendicular from overlapping edge of one sheet to underlying edge of adjacent sheet.
- L. Panel: The unit area of geomembrane that will be seamed in the field. A panel is a roll or portion of a roll without any seams.
- M. Panel Layout Drawings: Drawings submitted by the Contractor indicating in plan view the proposed panel numbers, orientations, and field seams.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01300 – Project Data Submittals.
- B. Prior to shipping HDPE geomembrane to the site, submit the following:
 - 1. Resin Data:
 - a. Statement of production date or dates.
 - b. Certification stating that the resin meets the product requirements.
 - c. Copy of quality control certificates issued by the manufacturer.
 - d. Test reports from the manufacturer.
 - e. Statement certifying that no more than 2% recycled polymer has been added to resin during manufacture of actual geomembrane used in this project.
 - 2. Geomembrane Data:
 - a. Manufacturer’s material specifications, product literature, sample measuring not less than 6 inches square, and other data as necessary to fully demonstrate that those materials proposed for use comply with the requirements of these Specifications.
 - b. Statement listing percentages/total of processing aids, antioxidants, and other additives other than carbon black added to or in the resin.
 - c. Manufacturer’s QC test results and certificates stating that the geomembrane meets the product requirements.
 - 3. Extrudate Beads and/or Rod Data:
 - a. Certification stating that the extrudate bead or rod resin is the same type, from the same manufacturer, and compatible with the resin used to manufacture the geomembrane supplied for this project.
- C. Installation plan describing the proposed methods and equipment for geomembrane deployment, panel layout, seaming, repair, and protection. The plan shall include a quality control program for the Contractor’s activities related to geomembrane installation.

- D. Records demonstrating Installer’s organizational and personnel qualifications.
 - E. Samples of seams to be used for destructive testing.
 - F. Contractor’s Work Plan and proposed equipment to place the 24-inch drain layer on the geotextile cushion and geomembrane, which meets the requirements of Subsection 3.8.C and Section 02300.
 - G. Manufacturer’s and Installer’s warranties.
 - H. Record Drawings showing all changes from the approved installation plan drawings. The record drawings shall identify and show the dimensioned location of each seam, repair, penetration, boot, and sample taken from the installed geomembrane.
 - I. QC test equipment calibration certificates.
 - J. Copies of all QC test data and results.
 - K. Warranties
- 1.5 QUALITY ASSURANCE AND QUALITY CONTROL
- A. Perform QC activities in accordance with Article 12 – General Conditions.
 - B. The Contractor shall engage and pay for the services of qualified staff or a qualified subcontractor to perform CQC activities. Subcontracted organizations shall be commercial entities normally engaged in QA/QC services for waste disposal facilities. Individuals, whether on the Contractor’s or subcontractor’s staff, shall have a minimum of 1 year of directly applicable experience pertinent to the requirements of this section.
 - C. The results of each day’s CQC testing and inspection shall be submitted to the Engineer before the start of installation on the next working day.
- 1.6 DELIVERY, STORAGE, AND HANDLING
- A. Delivery, storage, and handling of the geomembrane shall conform to ASTM D4873 and the manufacturer’s recommendations.
 - B. Each roll shall be labeled with the lot number, roll number, and other information necessary to identify it for inventory and CQC and CQA testing.
 - C. Upon delivery at the site, the Contractor and the Engineer shall inspect the surfaces of all rolls for defects and for damage. This inspection shall be conducted without unrolling rolls unless defects or damages are found or suspected. The Engineer will determine:
 - 1. Rolls, or portions thereof, which should be rejected and removed from the site because they have severe flaws.

2. Rolls or factory panels which include repairable flaws.
 3. Rolls that are not properly labeled. No unlabelled rolls shall be used for any application. Unlabelled rolls shall be removed from the site and replaced at the Contractor's expense.
- D. Immediately repair any damaged protective covering. Preserve integrity and legibility of geomembrane roll labels.
- E. Store and protect geomembrane from dirt, water, vandalism, and other sources of damage.
- F. Handling:
1. Use appropriate handling equipment to load, move, and deploy geomembrane rolls. Appropriate handling equipment includes cloth chokers, spreader bars and roll bars.
 2. Dragging panels on ground surface shall not be permitted.
 3. Do not fold geomembrane material. Folded geomembrane shall be rejected.

1.7 QUALIFICATIONS

- A. **Manufacturer Qualifications:** The manufacturer shall be a commercial entity normally engaged in manufacture of geomembranes for waste containment applications and shall have:
1. Manufactured at least 10 million square feet of HDPE geomembranes.
 2. Have at least 5 years continuous experience in the manufacturing of HDPE geomembrane.
- B. The geomembrane Installer shall have at least 5 years experience in the installation of HDPE geomembrane, totaling a minimum of 5 million square feet of installed HDPE geomembrane for 5 or more completed facilities.
- C. The Master Welder shall have completed a minimum of 2 million square feet of HDPE geomembrane seaming work using the type of seaming apparatus proposed for use on this project. The Master Welder shall be a full time employee of the Installer and present onsite during seaming operations.
- D. Seamers other than the master Welder shall have seamed a minimum of 500,000 square feet of HDPE geomembrane or have successfully passed seaming tests to the satisfaction of the Engineer.

1.8 WARRANTY

- A. Provide a manufacturer's warranty for the geomembrane material in compliance with provisions of the General terms and Conditions of the Contract. Provide a minimum 20-year warranty for the materials against deterioration.

- B. Provide an installation warranty for the geomembrane material in compliance with the General Terms and Conditions of the Contract. Provide a minimum 2-year non-pro rata warranty for the installation against defects.
- C. The warranties shall be provided to the Owner as purchaser and shall be signed by authorized representatives of the geomembrane manufacturer and Installer. The terms of the warranties shall, at a minimum, include, in addition to the requirements of this section, the applicable provisions of GRI GM13.

The manufacturer's warranty must be received as a condition for payment of materials delivered; and the installer's warranty must be received as a condition for payment for liner installed.

PART 2 - PRODUCTS

2.1 GEOMEMBRANE

- A. Material: High density polyethylene (HDPE). Unreinforced, 60 mil thick, textured both sides.
- B. Suppliers: All geomembrane rolls shall be furnished by one supplier.

2.2 GEOMEMBRANE RESIN

- A. Resin shall be new HDPE of first quality, compounded and manufactured specifically for producing HDPE geomembrane.
- B. Do not mix resin types during manufacturing.
- C. Resin shall not contain more than 2 percent clean recycled polymer by weight. The 2 percent recycled polymer shall not include any finished sheet material that has actually seen some type of service performance. Regrind, reworked, or trim materials in the form of chips or edge strips that have not actually seen some type of use may be added, if the material is from the same manufacturer and is the same formulation as the geomembrane being produced.

D. Resin shall meet the requirements in Table 1:

Table 1. HDPE RESIN REQUIREMENTS			
PHYSICAL CHARACTERISTIC	UNITS	TEST METHOD	REQUIREMENT
Density (Maximum)	g/cc	ASTM D1505	> 0.932
Melt Index	g/10 min	ASTM D1238 Condition 190/2.16	≤ 1.0

2.3 GEOMEMBRANE SHEET

- A. Provide finished product free from blemishes, holes, pin holes, bubbles, blisters, excessive gels, undispersed resins, and/or carbon black, contamination by foreign matter and nicks or cuts on edges.
- B. The physical, mechanical, and environmental properties of the finished sheet shall meet or exceed the values specified in Table 2:

TABLE 2. HDPE GEOMEMBRANE REQUIRED PROPERTIES				
PROPERTY	QUALIFIER	UNITS	TEST METHOD	REQUIREMENT
Thickness	min. avg. value	mil	ASTM D5199	60
	lowest individual reading	-	-	54
Specific Gravity (Sheet)	lowest individual reading	-	ASTM D1505	0.94
Tensile Properties (each direction)			ASTM D638 (Type IV)	
Strength at Yield	min. avg. value	lb/in		120
Elongation at Yield	min. avg. value	%		12
Strength at Break	min. avg. value	lb/in		200
Elongation at Break	min. avg. value	%		500

TABLE 2. HDPE GEOMEMBRANE REQUIRED PROPERTIES				
PROPERTY	QUALIFIER	UNITS	TEST METHOD	REQUIREMENT
Tear Resistance	min. avg. value	lb	ASTM D1004	40
Puncture Resistance	min. avg. value	lb	ASTM D4833	80
Carbon Black Content	range	%	ASTM D1603 or D4218	2 - 3
Carbon Black Dispersion	minimum 8 of 10	category	ASTM D5596	Category 1 or 2
Oxidation Induction Time	min. avg. value	minutes	ASTM D3895 or D5885	100
UV Resistance	min. avg. value	% retained after 1,600 hrs	GM 11 and ASTM D5885	50

2.4 EXTRUDATE ROD OR BEAD

- A. Extrudate rod or bead shall:
1. Be the manufacturer's standard product.
 2. Be made from same resin as the geomembrane.
 3. Have thoroughly dispersed additives throughout rod or bead.
 4. Contain 2 to 3 percent carbon black.
 5. Be free of contamination by moisture or any other foreign matter.

2.5 MANUFACTURER SOURCE QUALITY CONTROL

- A. The geomembrane manufacturer shall perform source quality control testing to confirm the manufacturer's published material characteristics and demonstrate compliance with this Section. Testing shall be performed at a minimum frequency of once per lot or once every 25,000 square feet, whichever results in the greater number of tests.
- B. The Contractor shall submit the geomembrane manufacturer's source quality certification for all rolls of geomembrane shipped to the site. Each quality control certificate shall include roll identification numbers and results of quality control tests. The quality control certificate shall be signed by a responsible party employed by the manufacturer, such as the production manager. The quality control certificate shall include:
1. Roll numbers and identification, resin lot, and batch numbers.
 2. Sampling procedures and results of quality control tests.

2.6 LABELING

- A. Each geomembrane roll shall be marked or tagged with the following information:
 - 1. Manufacturer's name.
 - 2. Product identification.
 - 3. Lot number.
 - 4. Roll dimensions.
 - 5. Roll weight.

PART 3 - EXECUTION

3.1 GENERAL

- A. Install geomembranes at the locations, lines, and grades shown on the Drawings. All geomembranes shall be installed in accordance with these Specifications.
- B. Perform all testing as specified.
- C. Materials and Work which fail to meet the requirements of these Specifications shall be removed and disposed of at the Contractor's expense.

3.2 GEOMEMBRANE SUBGRADE

- A. The subgrade on which the geomembrane is to be installed shall be smooth and free of any rocks, sharp objects, debris, or any other protrusions or deleterious material that may damage the geomembrane.
- B. The Contractor shall be solely responsible for protection of the geomembrane subgrade surface, including the intrusion of surface water beneath the geomembrane. Any damage to the geomembrane subgrade, including damage caused by geomembrane installation, shall be repaired at the Contractor's sole expense. Repair of damaged subgrade shall be completed prior to deployment of geomembrane in that area.
- C. Edges of anchor trenches, other excavations and grade changes shall be rounded to a minimum 6 inch radius, chamfered to an angle of no less than 135°, or, with the approval of the Engineer, cushioned using a geotextile.
- D. Geomembrane shall not be placed in an area which has been softened as a result of precipitation or groundwater.
- E. Any damage or displacement in the subgrade that occurs during geomembrane deployment shall be repaired prior to geomembrane seaming.

3.3 DEPLOYMENT

- A. The Engineer with the Installer will assign to each field panel an “identification code” (number or letter-number) consistent with the layout plan. This identification code shall be agreed upon by the Engineer and Installer. This field panel identification code shall be as simple and logical as possible. (Note that roll numbers assigned in the manufacturing plant are usually cumbersome and are not related to location in the field.)
- B. The Installer will establish a table or chart showing correspondence between roll numbers, factory panels, and field panel identification codes. The field panel identification code shall be used for all quality assurance records, including the Contractor’s QC testing.
- C. Field Panel Placement:
 - 1. Field panels shall be installed as indicated in the approved layout plan.
 - 2. Only as many field panels shall be deployed each day as can be continuously welded that same day.
 - 3. Sufficient geomembrane shall be deployed to account for shrinkage and contraction while avoiding wrinkles. Installed geomembrane shall be stress-free with no bridging before it is covered.
 - 4. Place sandbags, or other form of ballast approved by the Engineer, on the geomembrane to prevent uplift from wind.
- D. Placement Conditions: Geomembrane placement shall not proceed at an ambient temperature below 32 degrees F or above 100 degrees F as measured 6 inches above the geomembrane surface unless otherwise authorized by the Engineer. Geomembrane shall not be placed during any precipitation, in the presence of excessive moisture (e.g., fog, dew), in an area of ponded water, or in the presence of excessive winds. Placement methods shall prevent damage to underlying materials.
- E. Orientation:
 - 1. In general, seams shall be oriented parallel to the line of maximum slope, i.e., oriented up and down the slope.
 - 2. In corners and odd-shaped geometric locations, the number of seams shall be minimized.
 - 3. Seams shall be aligned to produce the fewest possible number of wrinkles and “fishmouths.” Before wrinkles fold over, attempt to push them out. Wrinkles that cannot be pushed out shall be cut out and the cuts repaired.
 - 4. Panels of geomembrane shall have a finished overlap of a minimum of 3 inches for extrusion welding and 5 inches for fusion welding. Overlap may be greater if so recommended by the geomembrane Manufacturer for the type of seaming equipment used.

- F. Temporary Bonding: Procedures used to temporarily bond adjacent panels together, if any, shall not damage the geomembrane; in particular, the temperature of hot air at the nozzle of any spot welding apparatus shall be controlled such that the geomembrane is not damaged. No solvent or adhesive shall be used for temporary bonding.
- G. Damage: The Engineer will inspect each panel, after placement and prior to seaming, for damage. The Engineer will direct the Contractor as to which panels, or portions of panels, should be rejected, repaired, or accepted. Damaged panels or portions of damaged panels which have been rejected shall be removed from the work area. Any repairs shall be made according to procedures described in this section of the Specifications.

3.4 FIELD SEAMING

- A. Seam Type:
 - 1. Double fusion welding shall be used for all seaming of geomembrane panels, large repairs, and other areas where practicable. Extrusion welding may be used in areas (such as corners), for small repairs, and other applications where fusion welding cannot be employed.
 - 2. No solvent or adhesive shall be used.
- B. Equipment:
 - 1. Only equipment which has been specifically designed for geomembrane seaming and which has been successfully used in applications similar to this project shall be used.
 - 2. Fusion-welding machines shall be automated vehicular-mounted devices. The fusion-welding machines shall be equipped with gages giving the pertinent temperatures.
 - 3. Extrusion-welding machine shall be equipped with gages capable of measuring the temperature at the nozzle or the preheat temperature.
 - 4. The Installer shall maintain on-site a sufficient number of spare operable seaming machines (at least one at all times) to ensure continuous operation.
- C. Seam Preparation:
 - 1. Cleaning: Prior to seaming, the seam area shall be clean and free of moisture, dust, dirt, debris of any kind, and foreign material.
 - 2. Grinding: If seam overlap grinding is required, the process shall be completed according to the geomembrane manufacturer's instructions within 1 hour of the seaming operation, and in a way that does not damage the geomembrane.
- D. Weather Conditions for Seaming: The allowable weather conditions for seaming are as follows:
 - 1. Seaming shall not be performed when ambient air temperatures are below 32 degrees F or above 100 degrees F, as measured 6 inches

- above the geomembrane surface. The Engineer will determine if these weather conditions are satisfied.
2. Seaming shall not be performed during precipitation events or the presence of extreme humidity (including fog) that prevents maintaining a dry surface.
 3. Seaming shall not be performed in the presence of excessive wind which distort panel alignment, blow dust into the seams, or otherwise adversely affect the seaming process or finished geomembrane layer.
- E. General Seaming Procedure: The general seaming procedure used by the Installer shall be as follows:
1. No seaming shall take place without the Master Welder present.
 2. If required, a firm substrate shall be provided by using a flat board, conveyor belt, or similar hard surface directly under the seam overlap to achieve proper support. This substrate shall be removed after seaming has been completed.
 3. Electric generators shall be placed on a smooth base such that no damage occurs to the geomembrane.
 4. A smooth insulating plate or fabric shall be placed beneath hot welding machines after usage.
 5. The geomembrane shall be protected from damage in heavily trafficked areas.
 6. If seaming operations are carried out at night, adequate illumination shall be provided.
 7. Personnel walking on the geomembrane shall not engage in activities or wear types of shoes that could damage the geomembrane.
 8. Smoking shall not be permitted while working on the geomembrane.
 9. The geomembrane surface shall not be used as a work area, for preparing patches, storing tools and supplies, or other uses.
 10. Protect the geomembrane in areas of heavy traffic by placing a protective cover that is compatible with and shall not damage the geomembrane.
- F. Extrusion Welding:
1. The extruder shall be purged prior to beginning a seam until all heat-degraded extrudate has been removed from the barrel.
 2. The edge of the top sheet of geomembrane shall be beveled to a minimum of 45 degrees and to the full thickness of geomembrane before extrusion welding.
 3. The geomembrane surface shall be abraded a maximum of one quarter of an inch beyond the weld bead area, using a disc grinder or equivalent, not more than 1 hour before welding.
 4. Grinding depth shall not exceed 4 mils.
 5. Grind across, not parallel to, welds.
 6. Change grinding discs frequently. Do not use clogged discs.

- G. Trial Seams:
1. Perform and test trial welds on samples of geomembrane to verify the performance of welding equipment, seaming methods, personnel, and conditions.
 2. No seaming equipment or welder shall be allowed to perform production welds until they have successfully completed trial welds.
 3. Trial seams shall be made at the beginning of each seaming period, for each seaming machine used that period. Also, each seamer shall make at least one trial seam each shift.
 4. Trial seams shall be made whenever the ambient temperature changes more than 20 degrees F since the previous trial seam.
 5. Trial seams shall be performed in the same surroundings and environmental conditions as the production welds (e.g., in contact with the geomembrane subgrade and similar ambient conditions).
 6. The trial seam sample shall be at least 2 FT long by 1 FT wide (after seaming) with the seam centered lengthwise. Seam overlap shall be as indicated in this section.
 7. Two adjoining specimens, each 1 IN wide, shall be cut from the trial seam sample by the Installer. The specimens shall be tested in shear and peel, respectively, using a field tensiometer. Neither specimen shall fail in the seam.
 8. If a specimen fails, the procedure and apparatus shall be adjusted as necessary, and another trial seam made and tested. The entire operation shall be repeated until a passing result is achieved.

3.5 TESTING

- A. Provide a tensiometer for onsite shear and peel testing of geomembrane seams. The tensiometer shall be:
1. Motor driven and have jaws capable of traveling at a measured rate of 2 inches per minute.
 2. Be in good working order, be built to ASTM specifications, and be accompanied by evidence of calibration within the last 12 months.
 3. Be equipped with a gauge that measures the force exerted between the jaws to an accuracy of better than 1 pound and has a digital readout.
- B. Provide a punch for the onsite preparation of specimens for testing in accordance with ASTM D6392.
- C. General Inspection:
1. Examine all welds and non-weld areas of the geomembrane for defects, holes, blisters, undispersed raw materials, and any sign of contamination by foreign matter. The surface of the geomembrane shall be clean at the time of the examination.
 2. Repair and non-destructively test each suspect location as described in this section.

- D. Non-Destructive Testing:
1. The Installer shall nondestructively test all field seams over their full length.
 2. All double fusion seams shall be tested using either the vacuum box or air pressure methods.
 3. All extrusion seams shall be tested using the vacuum box method.
 4. Vacuum box testing shall be performed in accordance with ASTM D5641.
 5. Air pressure testing shall be performed in accordance with Geosynthetic Research Institute Test Method GM6.
 6. All test equipment shall be in calibration and conform to manufacturer's specifications. The Installer shall submit current calibration certificates.
 7. Any seams which fail nondestructive testing shall be repaired in accordance with these Specifications and retested until a passing result is obtained.
 8. Seams that cannot be non-destructively tested, as agreed upon by the Contractor and Engineer, shall be capped and inspected by the Engineer.
- E. Destructive Testing:
1. Collect samples for destructive testing at locations as directed by the Engineer. Samples shall be taken at a minimum frequency of one per 500 FT of seam length. The Engineer, at his discretion, may increase the test frequency based on engineering judgment or a statistical method such as GRI GM14.
 2. The sample shall be a minimum of 12 inches wide by 44 inches long with the seam centered lengthwise.
 3. The Engineer shall provide a unique number for each sample. The Contractor shall mark the sample number and location, including dimensions, on the as-built panel layout drawing.
 4. Divide the sample into 4 parts as follows:
 - a. Cut a 1 inch wide strip from each end of the sample
 - b. Cut one 12 IN by 12 IN portion to be retained by the Contractor
 - c. Cut one 12 IN by 18 IN portion for the Engineer, to be submitted for laboratory testing
 - d. Cut one 12 IN by 12 IN portion, to be retained by the Engineer on behalf of the City, for archive storage.
 5. Field test the two 1 IN wide strips as follows:
 - a. Each sample shall be tested using a tensiometer for peel and shear.
 - b. Both test strips shall meet the peel and shear requirements for welded seams listed in Table 3.

TABLE 3. MINIMUM HDPE GEOMEMBRANE SEAM REQUIREMENTS			
PROPERTY	UNIT	TEST METHOD	REQUIREMENT
Shear Strength	lb/in. width	ASTM D6392	100 and FTB
Peel Adhesion	lb/in. width	ASTM D6392	80 and FTB

Notes:

1. Film Tear Bond (FTB) is defined as failure of one of the sheets by tearing, as opposed to separating from the other sheet at the weld interface area (i.e., the sheet fails before the weld fails). Tear may penetrate up to 10% into weld and still be acceptable.
 - c. If any field test sample fails, follow the failed test procedures in this section.
 6. The Contractor will perform the following tests on the seam samples:
 - a. Shear strength: ASTM D6392.
 - b. Peel Adhesion: ASTM D6392.
 - c. For each seam sample, 4 of 5 test specimens shall meet minimum requirements listed in Table 3.
 - d. If any test samples fail to achieve the minimum requirements of this Specification, follow the failed test procedures in this section.
 7. The Contractor will provide destructive seam test results within 48 hours from delivery of the destructive test sample to a qualified test lab. If the Contractor chooses to place material over the geomembrane prior to receipt of test results, and any of the QA tests fail to meet the requirements of this Specification, the Contractor shall, at his sole expense, remove the overlying material and follow the failed test procedures described in this section. The results of the QA laboratory testing shall take precedence over other test results.
 8. Immediately repair all holes in the geomembrane resulting from destructive test sampling. Repair in accordance with repair procedures described in this section. Test the continuity of the repair in accordance with the non-destructive testing requirements of this section.
- F. Failed Weld Procedures:
1. For the seam from which the failed sample was taken, the Contractor shall follow one of the following 2 options:
 - a. Option 1:
 - 1) Reconstruct the seam between any 2 passing test locations.
 - 2) Reconstruction methods shall be capping of the seam or replacing seam with a new 1 FT wide panel and welding in place. Welding the edge of the existing weld flap shall not be acceptable.

- b. Option 2:
 - 1) Trace the weld at least 10 FT in both directions from the location of the failed test, or to the end of the weld.
 - 2) Obtain a sample at each location for an additional field tensiometer test.
 - 3) If these additional test samples pass field tests, then take laboratory samples for QA testing as described above.
 - 4) If the laboratory samples pass, then reconstruct the seam between the two test sample locations that bracket the failed test location.
 - 5) If any sample fails, then repeat the process to establish the zone in which the seam must be reconstructed.

3.6 REPAIR PROCEDURES

- A. Repair any portion of the geomembrane exhibiting a flaw, or seams which fail a destructive or non-destructive test.
- B. Agreement upon the appropriate repair method shall be reached between the Engineer and the Contractor. Repair procedures shall include, but are not limited to, the following:
 - 1. Patching: Used to repair large holes (over 3/8 IN diameter), large tears, and similar large flaws.
 - 2. Abrading and re-welding: Used to repair small sections of seams.
 - 3. Spot welding or seaming: Used to repair small tears (less than 2 inches long), pin holes, or other minor, localized flaws.
 - 4. Capping: Used to repair large lengths of failed seams.
 - 5. Removing the seam and replacing with a strip of new material.
- C. All repairs shall be performed in accordance with the following procedures:
 - 1. For repairs involving extrusion welding, abrade the geomembrane surfaces to be repaired no more than one hour prior to the repair.
 - 2. Clean and dry all repair surfaces at the time of repair.
 - 3. Repairs incorporating patches or caps shall extend at least 6 inches beyond the edge of the defect. Round all corners of the patches to a radius of at least 4 inches.
 - 4. Unless otherwise directed by Engineer, cut the geomembrane below large caps to avoid water or gas collection between the sheets.
 - 5. Number and log each patch repair. Repair numbering shall be coordinated with the Engineer.
- D. Verification of repair:
 - 1. Non-destructively test each repair using the methods described in this section.
 - 2. Perform destructive tests as directed by the Engineer.

3. Repeat the repair procedure until all test results meet the requirements of this section.

3.7 GEOMEMBRANE ACCEPTANCE

- A. The Contractor shall retain all ownership and responsibility for the geomembrane until final acceptance of the Project by Engineer.
- B. The Engineer will accept the geomembrane installation when:
 1. All required documentation from the manufacturer and installer has been received and accepted.
 2. The installation is complete.
 3. Conformance test results have been received and verify that the product requirements of the Specification have been achieved.
 4. Test reports verifying completion of all field seams and repairs, including associated non-destructive and destructive testing, have been received.
 5. The Contractor has submitted all written certification documents and drawings required by this section.

3.8 MATERIALS IN CONTACT WITH GEOMEMBRANE

- A. Requirements of this article apply to placing soil directly on a geomembrane or on a geomembrane that is covered with a layer of geotextile.
- B. Temperature: Do not place soil materials on the geomembrane at ambient temperatures below 32 degrees F or above 100 degrees F.
- C. Spreading Equipment: Equipment used for spreading soil shall be a light low ground pressure dozer with a ground pressure not exceeding 5 pounds per square inch, or approved equal.
- D. Do not allow any vehicular traffic directly on geomembrane. A minimum soil thickness of 1 FT shall be maintained between spreading equipment and the geomembrane. Rubber-tired hauling vehicles shall operate on a minimum soil thickness of 3 FT.
- E. Spreading Operations: Spreading equipment shall not spin their tracks, make sharp turns, or make sharp, rapid starts or stops. Soil materials shall be pushed carefully from previously placed material and not dumped directly onto geosynthetics.
- F. When placing soil or other cover materials above the geomembrane, the Contractor shall ensure that:
 1. The geomembrane is not damaged through puncture, tear, or any other mechanism.
 2. There is no slippage of the geomembrane on underlying layers.

3. There is no excessive tensile stress developed in the geomembrane.
4. There are no folds or wrinkles in the geomembrane.

END OF SECTION

SECTION 02220 - REMOVAL OF STRUCTURES AND OBSTRUCTIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Removal, abandonment or relocation of features indicated on the Drawings and as required for the construction of the improvements. Removal of Structures and Obstructions includes the excavation, backfilling, and surface restoration for removed features; and excavation, backfilling and surface preparation for relocated features.

1.2 CONSTRUCTION REQUIREMENTS

- A. The Contractor shall remove, abandon, relocate, decommission or modify all pipes, fittings, foundations, structures, fences, utilities and other obstructions as indicated on the Drawings, as necessary to complete the work and as required by the Engineer.
- B. Salvageable material is to remain the property of the City; materials the City does not want shall be properly disposed of by the Contractor. The Engineer or City will identify the salvageable material and describe how the Contractor shall remove it and where it shall be stored, reused or relocated.
- C. Dispose of unsalvageable materials that are suitable for a municipal solid waste landfill in the active portion of the Landfill in accordance with the City of Unalaska operational requirements; and in conformance with applicable state and federal regulations, and as reviewed by the Engineer. Material not suitable for disposal in a MSW landfill shall be disposed of by the Contractor at the inert waste disposal area, as directed by the Engineer, at no additional expense to the City. There will be no charges by the City for proper disposal of materials at the landfill.

1.3 CONSTRUCTION QUALITY CONTROL

- A. Contractor shall perform the Work in accordance with Article 12 – General Conditions – Quality Assurance.
- B. During each aspect of the Work, quality control shall be provided by the Contractor to ensure that the workmanship conforms to the Drawings and Specifications.
- C. Any Work that does not satisfy the requirements of the Drawings and Specifications, shall be made good in accordance with the requirements of the Specifications or as directed by the Engineer at the sole expense of the Contractor.

- D. Proper function of any relocated, modified, or otherwise disturbed features that are required for reuse shall be demonstrated to the Engineer by the Contractor prior to the acceptance of the work.

1.4 DEFINITIONS

- A. Remove (Removal): Excavate, disconnect, expose or otherwise gain access to and impound a feature in preparation for its ultimate use or disposal. Features that are designated for removal may be salvaged (includes store or reuse), disposed of, relocated or processed (crushed).
- B. Abandon (Abandon in place): Remove only that portion required to ensure the protection of the Work and leave the remaining portion of the feature in place; includes capping, plugging or otherwise terminating the feature.
- C. Relocate: Preserve feature and its functionality and move the feature to a prepared location reviewed by the Engineer.
- D. Decommission: Similar to abandonment, but includes additional preparation that is specifically required for a particular feature.
- E. Modify: Preserve feature and its functionality in place by providing additional appurtenances specifically required for a particular feature.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 REMOVAL OF FACILITIES

- A. The Contractor shall remove all facilities as shown on the Drawings and as necessary to complete the Work. Relocation or replacement of the facilities as indicated on the Drawings includes surface preparation as directed by the Engineer. The Contractor shall field-verify the location of the utilities prior to any excavation. Contractor is advised that the Plans may not show all underground utilities and structures in the areas of construction and that location, depth and condition of utilities and structures may not be as shown or implied. Prior to any excavation in any area of construction, Contractor shall exercise due diligence and take all necessary measures to verify the location, depth and conditions of existing underground utilities and structures. The Contractor shall review the Drawings, as well as discuss his investigation efforts and findings with the Owner and Engineer. In addition, Contractor shall make reasonable efforts to verify the presence, or absence, and location of utilities and structures as deemed necessary or prudent by pot-holing, hiring a private locate service and other physical investigative measures necessary in advance of the actual construction work.

- B. Some obstructions may not be shown. The removal and replacement of minor obstructions shall be anticipated and accomplished at no additional cost to the Owner.
- C. Coordinate all utility work with the appropriate purveyor. Remove all existing utilities designated for removal or relocation that are uncovered by work, and relocate or terminate in a manner conforming to the nationally recognized code covering the specific utility and at a time satisfactory to the Engineer. Verify and determine requirements for relocation or abandonment of utility lines encountered that are not shown on the Drawings in accordance with the Engineer.
- D. Minor facilities consist of, but are not limited to, geosynthetic materials, pipe, fittings, valves, fiber optic facilities and support structures.
- E. Major facilities requiring removal and those that are not shown on the Drawings, or could not have been foreseen by visual inspection of the site prior to bidding, should immediately be brought to the attention of the Engineer in writing. The Engineer shall make a determination before proceeding with the work. If the Engineer finds that the facility adversely affects the Contractor's costs or schedule for completion, a proper adjustment to the Contract shall be made in accordance with Article 9, General Conditions – Changes.
- F. Unless otherwise noted, or determined salvageable by the City or Engineer, all features designated for “removal” on the plans shall be considered unsalvageable. Salvageable material shall remain the property of the City. The Contractor shall exercise due diligence and care in removal of material identified as salvageable to prevent damage. If, in the opinion of the Engineer, salvageable material is unnecessarily damaged or destroyed, it shall be replaced at no additional cost to the Owner. Salvaged material shall be stored at the project site as directed by the Engineer and/or City. Landfill waste excavation material shall be disposed of in accordance with Section 02300 - Earthwork. The muck from the pond excavation shall be stockpiled as directed by the Engineer.

3.2 REMOVAL OF FOUNDATIONS

- A. Contractor shall remove foundations to a depth of at least 5 FT below finished ground elevation or subgrade elevation, whichever is lower.
- B. Contractor shall fill cavities left by the removal of structures. The fill shall match the level of surrounding ground. Fill shall be placed and compacted as per the requirement of Section 02300 - Earthwork.

3.3 REMOVAL OF STRUCTURES

- A. Unless otherwise directed, the Contractor shall remove entire drainage structure, including appurtenances, foundations, headwalls or other associated structures to a point 2 feet below the subgrade ground elevation, or the adjacent ground elevation.
- B. Restoration of areas associated with the removal and/or relocation of structures shall match existing coincident materials.
- C. Removal of culverts shall be as per Section 02600 – Surface Water Drainage.

3.4 ABANDON STRUCTURES

- A. Where shown on the Drawings or where designated by the Engineer to abandon an existing manhole, catch basin, or vault, the structure shall be broken down to a depth of at least 4 FT below the revised surface elevation.
- B. All connections shall be plugged.
- C. The structure shall be filled with import fill and compacted to 95 percent density as specified in Section 02300 - Earthwork.

END OF SECTION

SECTION 02230 - CLEARING, GRUBBING, AND STRIPPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Removal of all vegetation, surface debris, and other objectionable materials within the clearing limits, stripping of all organic material from the surface down to the underlying soil, and disposal of all material removed as part of the clearing, grubbing and stripping operations.

1.2 CONSTRUCTION REQUIREMENTS

- A. Remove and dispose of all vegetation and surface debris as indicated on the Drawings and described in the Contract Documents.
- B. At all times, conduct operations to prevent pollution of air and water in accordance with applicable state and local regulations.

1.3 SITE INVESTIGATIONS

- A. Carefully examine the site to determine the full extent of the Work required conforming to the Drawings and this specification.
- B. Determine the nature and location of the Work, conditions, the formation and condition of the existing ground surface, obstacles to be encountered, and the character, equipment and facilities needed prior to and during execution of the Work. Any inaccuracies or discrepancies between the Drawings and Specifications shall be brought to the City's and the Engineer's attention in order to clarify the exact nature of the Work to be performed.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 CLEARING AND GRUBBING

- A. Clearing and grubbing includes the removal of all vegetation, debris and other objectionable materials, including, but not limited to, grass, weed growth, brush, shrubs as indicated on the Drawings and described in the Contract Documents.
- B. Vegetation is to be removed to the ground surface.
- C. Root mats are to be removed.
- D. Review material to be cleared and grubbed with the Engineer to determine suitability for on-site disposal. Dispose of material as described in paragraph 3.3.

- E. Provide proper drainage control during clearing and grubbing operations in accordance with Section 02370 – Erosion and Sedimentation Control Products.
 - F. Holes resulting from the removal of underground structures and roots that extend below the finished grade shall be cleaned and backfilled with suitable materials and compacted in conformance with the requirements of Section 02300 - Earthwork.
- 3.2 STRIPPING
- A. Stripping shall consist of removing and disposing of all organics, bark, straw, straw bales, sod, grass roots, and other objectionable materials from the surface down to the underlying soil. Strippings shall not be mixed with the underlying soil.
- 3.3 DISPOSAL OF MATERIALS
- A. Logs, stumps, roots, brush, rotten wood, trash and other refuse from the clearing, grubbing and stripping operations acceptable for on-site disposal shall be disposed of in conformance with the City of Unalaska operational procedures at the Landfill unless otherwise requested in writing by the City. Such requests shall state the conditions covering the disposal of such products and shall also state the areas in which they may be placed. Permission to dispose of such products on private property shall be in writing, and a copy of this permit shall be filed with the City. Disposal of refuse and debris and any accidental loss or damage attendant thereto shall be the Contractor's responsibility.
 - B. Properly dispose of any objectionable material that is not acceptable for disposal at the Landfill in an off-site disposal facility.
 - C. Coordinate all disposal in the Landfill with the operations staff.
 - D. Soils removed in association with clearing of site vegetation and stripping shall be collected and stockpiled as directed by the Engineer. Stockpile and handle these soils such that material shall not be transported offsite due to the effect of stormwater or wind action.

END OF SECTION

SECTION 02245 - BENTONITE CLAY SEAL

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Production of low-permeability earthen material by mixing sodium bentonite with soil, including necessary testing, haul and placement and compaction of the material. The bentonite seal is for 1) the two new monitoring wells and 2) removal and abandonment of three existing monitoring wells.

1.2 REFERENCES

- A. Referenced Standards: This section incorporates by reference the latest revision of the following documents. It is part of this section as specified and modified. In case of conflict between the requirements of this section and that of the listed documents, the requirements of this section shall prevail:
 - 1. American Petroleum Institute (API) Specification 13A.
 - 2. ASTM D698: Standard Test Methods for Laboratory Testing.

1.3 DEFINITIONS

- A. Base Soil: Soil to be mixed with bentonite.
- B. Soil-Bentonite Mixture (Seal): A mixture of base soil and powdered Bentonite that produces a material having a low coefficient of permeability.

1.4 QUALITY ASSURANCE

- A. Perform QC activities in accordance with Article 12 – Quality Assurance.

1.5 DELIVERY, STORAGE AND HANDLING

- A. After processing, the Soil-Bentonite mixture shall be allowed to hydrate and shall be protected at all times from over-wetting.

PART 2 - PRODUCTS

2.1 BASE SOIL

- A. Soil shall be 1-inch minus with fines meeting the requirements of D-1 Aggregate in accordance with Section 02300 - Earthwork.

2.2 BENTONITE

- A. The bentonite used in the admix shall consist of a commercially prepared sodium montmorillonite clay. Acceptable products shall have been used in similar applications.

- B. Bentonite shall meet the requirements of API Specification 13A, Section 4, with a minimum yield of 91 barrels.
- C. The bentonite shall have a free swell of 15 ml per 2 gm or greater.
- D. Dry fineness of the bentonite shall be:
 - 1. 100 percent passing a No. 10 U.S. sieve.
 - 2. 20 percent maximum passing a No. 200 U.S. sieve

PART 3 - EXECUTION

3.1 PLACEMENT AND HANDLING

- A. Prior to the placement of Soil-Bentonite Seal the Contractor shall notify the Engineer that the base has been prepared, and shall allow a reasonable time for review.

3.2 MIXING

- A. Bentonite soil mix shall be a prepared clay seal of 15/85 percent volume of Bentonite to soil. The moisture content shall be at within $\pm 3\%$ of optimum moisture content.
- B. Materials shall be of the proper moisture content to achieve optimal compaction with techniques as reviewed by the Engineer. The Contractor shall control the production of Soil-Bentonite Seal such that, material produced during one working day shall be placed during the same day.
- C. After processing, the Soil-Bentonite Seal shall be hydrated prior to being placed.

END OF SECTION

SECTION 02250 - SHEETING, SHORING, BRACING, AND SLOPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Sheeting, shoring and bracing of trenches, trench boxes, and sloping of other excavations to protect the Work, as well as existing property, utilities, etc., and to provide safe working conditions in the excavations.

1.2 QUALITY ASSURANCE

- A. This section incorporates by reference the latest revision of the following documents. It is part of this section as specified and modified. In case of conflict between the requirements of this section and that of the listed documents, the requirements of this section shall prevail:
1. American Society for Testing and Materials (ASTM) ASTM A36/A36M-00a: Standard Specification for Carbon Structural Steel.
 2. American Institute of Steel Construction (AISC): Specifications for the design, fabrication and erection of structural steel for buildings (AISC)/IS 800, 9th edition.
 3. ASTM A328M-00: Standard Specification for Steel Sheet Piling.
 4. Occupational Safety and Health Administration (OSHA), 29 CFR 1926 PART 1926 – Safety and Health Regulations for Construction, Subpart P – Excavations.

1.3 WARRANTY

- A. The failure or refusal of the Engineer, Owner, Contracting Officer, Project Manager, Inspector, or on-site representative to suggest the use of bracing or sheeting, or a better quality, grade, or section, or larger sizes of steel or timber, or to suggest sheeting, bracing, struts, or shoring to be left in place, shall not in any way or to any extent relieve the Contractor of any responsibility concerning the condition of excavation or of any of his obligations under the Contract, nor impose any liability on the Engineer or his agents; nor shall any delay, whether caused by any action or want of action on the part of the Contractor, or by any act of the Engineer, or their agents, or employees, resulting in the keeping of any excavation open longer than would otherwise have been necessary, relieve the Contractor from necessity of properly and adequately protecting the excavation from caving or slipping, nor from and of his obligations under the Contract relating to injury to persons or property, nor entitle him to any claims for extra compensation.

1.4 SUBMITTALS

- A. Submit plans showing proposed methods and construction details for all construction excavations 4 FT or more in depth. The plan shall address both

construction and removal of all required shoring. The plan shall include drawings and calculations prepared by (or under the direction of) a professional engineer licensed in the State of Alaska, and shall carry the professional engineer's signature and seal.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Wood Materials: Use wood sheeting, sheet piling, bracing and shoring which is in good serviceable condition and timbers of sound condition, free from large or loose knots and of proper dimension.
- B. Steel Materials: Steel sheet piling and bracing of equal strength or better may be substituted for wood.

PART 3 - EXECUTION

3.1 GENERAL

- A. Sheet, shore and brace or use a trench box at all open excavations where necessary to prevent injury to workmen, or damage to structures, pipelines or other features.
- B. Used material shall be in good condition, not damaged or excessively pitted. All steel or wood sheeting designated to remain in place shall be new. New or used sheeting may be used for temporary work.
- C. Steel: Design all steel work for sheeting, shoring, and bracing in accordance with the provisions of the AISC specifications.
- D. Steel Sheet Piling: Manufactured from steel conforming to ASTM A328. Steel for soldier piles, wales and braces shall be new or used and shall conform to ASTM A36. Furnish mill test reports on new piling but not used ones.
- E. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Carry down shoring and bracing as excavation progresses.
- F. Unless otherwise shown, specified, or ordered, remove all materials used for temporary construction when work is completed. Make this removal in a manner not injurious to the structure or its appearance or to adjacent Work.
- G. Safe and satisfactory sheeting shall be the entire responsibility of the Contractor.
- H. Earthwork methods and materials shall be as specified in Section 02300 – Earthwork.

3.2 REMOVAL OF SHEETING AND BRACING

- A. Remove sheeting and bracing from excavation unless otherwise directed in writing by the Engineer.
- B. Conduct removal such that damage is not caused to the work.
- C. Removal shall be equal on both sides of excavation to ensure no unequal loads on pipe or structure.
- D. Defer removal of sheeting, shoring and bracing, where removal may cause soil to come into contact with concrete until the concrete has cured a minimum of 7 days.

3.3 EXAMINATION

- A. Examine the site to determine the conditions under which work shall be performed.
- B. Conclusions as to the extent of the existing subsurface conditions are the responsibility of the Contractor.
- C. It is the Contractor's responsibility for all trench construction and maintenance, including the adequacy of trench sheets, shoring and bracing. Damages resulting from improper sheeting, shoring or bracing or from failure to sheet, shore, or brace is the responsibility of the Contractor.
- D. Shoring, sheeting, bracing, and sloping necessary to support the sides of any excavation, to keep and to prevent any movement that may damage adjacent utilities, or structures, damage or delay the work, or endanger life and health shall be installed and maintained. A combination of shoring and overbreak, sheeting, bracing, sloping, tunneling, boring, sliding trench shields or other methods of accomplishing the work, may be used provided the method meets with the approval of all applicable local, state and federal safety codes (OSHA).
- E. Using skilled labor, drive or set sheeting, sheet piling, braces or shores in place and arranged so that they may be withdrawn as the excavations are backfilled, without injury to piping and structures, and without injury to or settlement of adjacent structures.
- F. That portion of cribbing or sheeting extending below the springline of rigid pipe or below the crown elevation of flexible pipe shall be left in place unless satisfactory means of reconsolidating bedding, or side support disturbed by cribbing, or sheeting removal, can be demonstrated.
- G. The use of horizontal strutting below the barrel of pipe or the use of the pipe as support for trench bracing shall not be permitted. The bedding or side

support shall be carefully reconsolidated behind the movable box prior to placing backfill.

3.4 TRENCH EXCAVATION SAFETY SYSTEMS

- A. Protect all utility trench excavation in excess of 4 feet in depth with a safety system conforming to the referenced requirements.
- B. Trench safety systems shall be designed by a qualified person and meet the referenced requirements.
- C. All excavation not included in trench safety systems shall also meet the state safety standards.

3.5 SPECIAL REQUIREMENTS FOR HDPE PIPE TRENCHES

- A. Shoring to be removed, or movable trench shields or boxes, shall be located at least 2-1/2 DIA away from the pipe if the bottom of the shoring, shield or box extends below the top of flexible pipe, unless a satisfactory means of reconsolidating the bedding, or side support material disturbed by shoring removal, can be demonstrated.
- B. Damages resulting from improper shoring or failure to shore shall be the sole responsibility of the Contractor.

END OF SECTION

SECTION 02300 - EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. This section describes general requirements for earthwork including: excavation, dewatering, controlled fill, backfill, compaction, grading, processing, stockpiling, disposal of unsuitable materials, aggregates, embankment, sub-grade preparation, over-excavation and replacement, and quality control testing. The work includes delivery of submittals prior to work, scheduling work in advance with the Engineer; protection of all streets, roads, grading, structures, quality control testing and reporting and other incidental work in accordance with the plans and specifications.

1.2 QUALITY ASSURANCE

- A. Referenced Standards: This section incorporates by reference the latest revision of the following documents. It is part of this section as specified and modified. In case of conflict between the requirements of this section and that of the listed documents, the requirements of this section shall prevail:
1. American Society for Testing and Materials (ASTM):
 - a. C136-06: Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - b. D75-03: Standard Practice for Sampling Aggregates.
 - c. D422-63 (1998): Standard Test Method for Particle-Size Analysis of Soils.
 - d. D1557-02e1: Test Method C for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).
 - e. D2216-05: Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.
 - f. D2434-68 (2006): Standard Test Method for Permeability of Granular Soils (Constant Head).
 - g. D2487-06: Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).
 - h. D2922-05: Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
 - i. D3017-05: Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
 - j. D4318-05: Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
 - k. D4718-87 (2001): Standard Practice for Correction of Unit Weight and Water Content for Soil Containing Oversize Particle.

1. C117-04: Standard Test Method for Materials Finer than 75- μm (No.200) Sieve in Mineral Aggregates by Washing.
 2. American Association of State Highway and Transportation Officials
 - a. T 11: Materials Finer Than 75- μm (No. 200) Sieve in Mineral Aggregates by Washing
 - b. T 27: Sieve Analysis of Fine and Coarse Aggregates
 - c. T89: Determining the Liquid Limit of Soils
 - d. T90: Determining the Plastic Limit and Plasticity Index of Soils
- B. Verbally inform the Engineer of all failed field test results within one hour after completion of the test. Provide written or electronically deliver all field and lab test results within 24 hours after completion of testing.

1.3 DEFINITIONS

- A. Borrow: Material excavated on the site or taken from designated borrow areas.
- B. Compaction: The application of controlled forces to soils placed in lifts, using mobilized equipment, to achieve a prescribed soil density, in accordance with established standards.
- C. Completed Course: A course or layer that is ready for the next layer or next phase of the work.
- D. Coverage: Coverage is defined as the requirement of successive trips of a piece of compaction equipment, which by means of sufficient overlap, shall ensure that all areas of the layer being compacted have been subjected to one pass of the compaction equipment.
- E. Excavation: Excavation includes, loading, hauling, placing, compacting, windrowing, and stockpiling as required to place the excavated materials in their designated destinations.
- F. Imported Material: Material obtained by the Contractor from sources off the site.
- G. Influence Area: The area within planes sloped downward and outward at an angle of 60 degrees from the horizontal from (a) 1 foot outside the outermost edge at the base of foundations or slabs; or (b) 1 FT outside the outermost edge at the surface of roadways or shoulder; or (c) 0.5 FT outside the exterior edge at the spring line of pipes and culverts.
- H. Landfill Waste (Refuse): Material excavated from the site that contains municipal refuse, sludge, leachate, incinerator ash, glass, metal, and organic debris.

- I. Optimum Moisture Content: The moisture content that will result in a maximum dry unit weight of soil when subjected to the ASTM D1557 Method C compaction test.
- J. Percent Compaction: The percent compaction in-place shall be calculated as the ratio (in percent) of the in-place dry density to the estimated maximum dry density, in accordance with ASTM D1557 Method C, of the representative fill material at the location of the in-place density test.
- K. Prepared Sub-grade: The ground surface after clearing, grubbing, stripping, grading, excavation, smoothing, and/or compaction to meet the requirements for placement of the next overlying layer of earthen or geosynthetic material.
- L. Proof Rolling: Rolling a soil or rock surface with a minimum of 3 passes with compaction equipment as specified and reviewed by the Engineer for the purpose of detecting soft or loose areas.
- M. Site: The property owned by the City within the boundaries shown on the Drawings, easements and rights-of-way for roads, drainage facilities, and pipelines, and the Contractor's working and storage areas adjacent to the facilities.
- N. Stockpiles: Soil temporarily placed in piles for future use by Operations staff or the Contractor.
- O. Structural Backfill: That material placed above the base of the structure to the existing or proposed sub-grade and the placement thereof.
- P. Structural Excavation: That material removed for the purposes of accommodating structures of all types and the removal and handling thereof.
- Q. Suitable Material: Material imported or excavated from the cut areas, which is suitable for use in constructing fills.
- R. Unsuitable Material: Material from project excavations which, in the opinion of the Engineer, is not suitable for use in backfill or compacted fills.
- S. Well-Graded: A mixture of particle sizes that has no specific concentration, or lack thereof, of one or more sizes. A material type that, when compacted, produces a strong and relatively incompressible soil mass.
- T. Cells II-1 and II-2 Construction: Includes all components and work necessary to construct the liner system, leachate collection system, and underdrain system. Also consists of excavation for Cells II-1 and II-2, which includes all work necessary to remove soil from, or provide controlled fill for Cells II-1 and II-2 to the lines and grades shown on Drawings and as adjusted in the field by the Engineer.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01300, Project Data Submittals and Samples.
- B. A pre-construction plan shall be submitted to the Engineer at least 15 days prior to any earthwork activities. The Construction Plan shall, at a minimum, include the following:
 - 1. Proposed source(s) and proposed method(s) of sampling source(s) for acceptance.
 - 2. Proposed soil processing, placement, compaction, and moisture control equipment, including equipment catalog with weight, dimensions, ground pressure exerted by track or rubber tire machines expressed in (psi), and operating data.
 - 3. Proposed work schedule.
 - 4. Proposed method of protecting work, to include drainage measures and freeze protection.
 - 5. Coordination of compaction testing, performed by Engineer.
 - 6. Proposed excavation, stockpiling, re-grading and staging plan describing handling and transport of on-site and off-site materials, including refuse haul.
 - 7. Proposed proof rolling method and equipment for each sub-grade condition.
 - 8. Submit plans showing proposed methods and construction details for all construction excavations 4 FT or more in depth and for excavation in wet areas requiring draining prior to excavation. The plan shall address both construction and removal of all required shoring. The plan shall include drawings and calculations prepared by (or under the direction of) a professional engineer licensed in the State of Alaska, and shall carry the professional engineer's signature and seal. Refer to Section 02250 – Sheeting, Shoring, Bracing, and Sloping; and Section 02316 – Trench Excavation and Backfill.
 - 9. Submit plans showing proposed methods and construction details for all excavation in areas with standing water. The plan shall address both dewatering and excavation of saturated and unsuitable material. Contractor shall follow the project SWPPP permit requirements as required by Section 02370.
- C. Source Quality Control Submittals:
 - 1. Submit laboratory test results for each type of fill to the Engineer. Required tests are listed in Section 3.9 Quality Control.
 - 2. Submit name of imported materials suppliers.
 - 3. Submit certificate of Conformance with specifications from supplier for all imported material.
- D. Field Quality Control Submittals
 - 1. Submit materials test results in accordance with Section 01300 Project Data Submittals.

1.5 SEQUENCING AND SCHEDULING

- A. Notify Engineer at least 1 working day prior to commencement of subgrade compaction and proof-rolling.

1.6 PROTECTION

- A. All streets, roads, grading, structures, utilities, wells, survey monuments, and other improvements not specifically designated to be cleared, removed, stripped or altered as a part of the work shall be protected from damage throughout the construction period. Any damage caused by the Contractor, his employees, agents, or any lower tiered subcontractors shall be immediately repaired and re-established to the original condition and to the satisfaction of the Engineer at no additional cost to the City. Completed work (e.g. earthwork and foundations) shall be protected from wetting, drying and freezing by providing temporary drainage features and blankets or protective cover soil layers as necessary.
- B. Existing Utilities:
1. Known existing utilities are indicated on the Drawings and should be shown on the Contractor's Construction Plan. Hand excavate all excavations within 2 feet of areas where existing utilities are indicated.
 2. Verify the actual locations of all existing utilities within the excavation area through the use of a qualified utility location services firm and by hand excavation. The Contractor is fully responsible for all utilities found through the location services, by hand excavation and/or which were indicated on the Drawings.
 3. Record the utility locations on the As-Built record drawings.
 4. Any existing utility indicated in the Construction Plan and on the Drawings that is damaged shall be immediately repaired in a manner acceptable to the Engineer at no additional cost to the City.
 5. If excavation or other work will be within ten feet of any existing electrical utility either above or below ground, Lockout/Tagout is required. Provide 24-hour prior notice to the Engineer and the Unalaska Department of Public Utilities of planned excavations of this type. Coordinate with the City and the applicable utility companies to arrange for and perform this Lockout/Tagout.
 6. Notify the Engineer immediately if any existing utilities, which were not indicated, are encountered during excavation.
 7. Obtain approval from the Engineer before backfilling existing utilities. Utility warning tape shall be placed 12 inches above existing utilities. Damage to Mylar utility identification tape shall be repaired 18" before and after each break, double layered, and fastened together with appropriate staples or fasteners to support and maintain continuity.
 8. Excavate and clean the existing liner systems as required to establish sub-grade and make continuous connections between proposed liner systems and the existing liner systems as shown on the Drawings. The approximate limits of this excavation are indicated on the Drawings,

however, the locations are approximations, and as such, it is the responsibility of the Contractor to locate and expose the existing liner and to adjust the required excavation if so directed by the Engineer. Equipment and methods shall be utilized to protect the integrity of all lining materials. The Engineer may inspect for damage at any time. Repair damage as directed by the Engineer and modify construction methods to prevent further damage. Damage to existing liner and leachate systems caused by the Contractor's excavation over or adjacent to the existing liner shall be repaired at the Contractor's expense.

9. Do not excavate or operate equipment within 5 FT of any monitoring wells or probes not designated to be removed. Damaged wells or probes will be re-established at the sole expense of the Contractor.

1.7 REGULATORY REQUIREMENTS

- A. Permits: Obtain and comply with the appropriate local, state, and federal permits and licenses required for transporting affected soil to the selected disposal site.
- B. Manifests/Bills of Lading: Contractor is responsible for completing manifests, bills of lading, or similar documentation for all wastes transported from the site and will supply copies of the documents to the City within 24 hours of shipment.

1.8 POTENTIAL FOR REMNANT EXPLOSIVES IN STOCKPILED SHOTROCK

- A. The stockpiled shotrock shown on Drawing C-201 has been identified to contain remnants of explosives from previous blasting operations at the originating site. Refer to SC-10 of the Supplementary Conditions and note on Drawing C-230.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General:
The Engineer, prior to use or delivery to the site, must review and accept all materials and material sources.
- B. Import Fill – Limit to 3-inch minus Aggregate containing no muck, frozen material, roots, sod or other deleterious matter and with a plasticity index not greater than 6 per AASHTO T 98 and T 90. Meet the following gradation per AASHTO T 27/T 11:

<u>Sieve</u>	<u>Percent Passing by Weight</u>
No. 200	0-8% determined on the minus 3 IN portion of the sample

- C. Liner Foundation Material - Imported natural sand or sandy material produced from crushing; washed; free of clay, shale, and organic matter; conforming to the gradation in Table 1 in accordance with ASTM C136 and ASTM C117.

TABLE 1 LINER FOUNDATION MATERIAL GRADATION REQUIREMENTS	
US STANDARD SIEVE SIZE	PERCENT PASSING BY WEIGHT
1-IN	100
3/4-IN	70-100
3/8-IN	50-80
No. 4	35-65
No. 8	20-50
No. 50	8-30
No. 200	0-6

- D. D-1 Aggregate/Surface Course – Crushed stone or crushed gravel, consisting of sound, tough, durable pebbles or rock fragments of uniform quality free from clay balls, vegetable matter, or other deleterious matters meeting the following requirements:

1. Percent of Wear (AASHTO T96) of not more than 45.
2. Degradation Value (Alaska Test Method 313) of not less than 45.
3. Percent Fracture (Alaska Test Method T-4) of not less than 70.
4. Liquid limit (AASHTO T89) of not more than 35.
5. Plastic index (AASHTO T90) of not more than 10.
6. Aggregate Surface Course Material shall be graded within the limitations delineated below (ADOT&PF Section 703, Table 703-2).

TABLE 2 D-1 AGGREGATE/SURFACE COURSE GRADATION REQUIREMENTS	
US STANDARD SIEVE SIZE	PERCENT PASSING BY WEIGHT
1-IN	100
3/4-IN	70-100
3/8-IN	50-80
No. 4	35-65
No. 8	20-50
No. 50	8-30
No. 200	0-6

- E. Quarry Spalls – Quarry spalls shall consist of broken stone or broken concrete rubble. Riprap and quarry spalls consisting of broken stone or concrete rubble shall be free from segregation, seams, cracks, and other defects tending to destroy its resistance to weather and shall conform to the following requirements for quality.
1. Degradation factor 15 minimum
 2. Los Angeles Wear, 500 Rev. 50% maximum
 3. Specific Gravity 2.55 minimum
 4. Quarry spalls shall meet the requirements in Table 4 for grading.

TABLE 3 QUARRY SPALLS AND RIPRAP	
ITEM	QUARRY SPALLS
Maximum Size	8 IN
50 percent by weight shall be larger than	3 IN
Minimum Size	3/4 IN

- F. Drain Layer Material – Drain layer material shall be produced from crushing; washed; free of clay, shale, and organic matter; conforming to the following requirements in accordance with ASTM C136 and ASTM C117:
1. Material shall be composed of crushed rock and angular gravels.
 2. Permeability: All gravel shall exhibit a permeability of 1×10^{-2} cm/sec (3.9×10^{-3} in/sec) or greater after placement.
 3. Strength: Drain Layer Material shall have an angle of internal friction of 28 degrees or higher.
 4. Percent of wear (AASHTO T96) of not more than 45.
 5. Degradation Value (Alaska Test Method 313) of not less than 45.

TABLE 4 DRAIN LAYER MATERIAL GRADATION REQUIREMENTS	
US STANDARD SIEVE SIZE	PERCENT PASSING BY WEIGHT
1-IN	100
3/4-IN	80-100
3/8-IN	10-40
No. 4	0-4
No. 200	0-2

- G. Structural Fill:
1. Material – Structural fill shall be well-graded gravel, with a maximum particle size of 1/2” and no more than 6% fines (200 screen).

- H. Trench Bedding and Backfill Material:
 - 1. This material shall be D-1 Aggregate.

PART 3 - EXECUTION

3.1 GENERAL

- A. Equipment:
 - 1. All equipment and tools used in the performance of this work are subject to the review and acceptance of the Engineer before work is started.
 - 2. Provide compaction equipment appropriate for the material types to obtain the densities specified.
 - 3. Provide hand-operated compaction equipment in areas closer than 2 feet from structures to obtain the densities specified.
 - 4. Operate and maintain compaction equipment in accordance with the manufacturer's instructions and recommendations. If inadequate densities are obtained, provide larger and/or different type equipment at no additional cost to the City.
 - 5. Provide equipment for applying water of a type and quality adequate for the Work, free of leaks and equipped with a distributor bar or other approved device to ensure uniform application.
- B. Equipment for Operating Above Geomembrane:
 - 1. Track-mounted equipment with low ground pressure treads, no larger than a Caterpillar Model D5 LGP or approved equal having a ground pressure of 5 psi or less, shall be used for spreading materials over geomembrane. In no case shall tracked equipment be allowed to operate on less than 12 inches of cover over geomembrane.
 - 2. Equipment other than the above-described track-mounted equipment may be operated above geomembrane on temporary haul roads at least 3 feet thick. Material used in temporary haul roads over geomembrane to place drain layer material can be incorporated as part of the drain layer material, provided the material has not been contaminated and meets the requirements of drain layer material.
 - 3. No equipment of any kind shall be allowed directly on top of the geomembrane. Refer to Section 02078 – HDPE Geomembrane for additional equipment restrictions on geomembrane.
- C. Verification of Conditions:
 - 1. Verify all lines, limits and grades prior to beginning construction activities.
 - 2. Verify that the survey control system is installed and properly protected from construction operations prior to earthwork.

3.2 PREPARATION

- A. Clearing, Grubbing, and Stripping:
 - 1. All Clearing, Grubbing, and Stripping activities shall be performed in accordance with Section 02230 of the Specification. Engineer's inspection and approval is required before covering cleared areas.
 - 2. Remove immediately before placing surfacing materials, all brush, weeds, vegetation, grass, wood chip layer, straw bales, litter/refuse, and other debris.
 - 3. Drain water from ponds, low spots or ruts and discharge in accordance with Section 02370 of the Specification.
 - 4. Remove all sediments from pond areas down to native gravels or other materials suitable for cell foundation as directed by the Engineer.

- B. Sub-grade Preparation – Cells II-1 & II-2:
 - 1. After completion of excavation, fine grading, clearing and grubbing, or other surface preparation measures and prior to foundation, fill or geosynthetic construction, proof-roll the surface to detect soft or loose zones. Proof roll the accessible surface making a minimum of 3 passes each way, back and forth using a vibratory soil compactor capable of delivering 55,000 lbs of centrifugal force, such as a CAT CP-533E. Maintain suitable moisture for the purposes of detecting wet, soft, loose under-compacted, over optimum soil moisture, or optimum density of materials too coarse for density testing using nuclear methods.
 - 2. If soft or loose zones are found during proof-rolling, excavate and replace the soft or loose material to a depth accepted by the Engineer, using Import Fill as specified.
 - 3. Shape the entire sub-grade to a uniform surface running reasonably true to the line, grade, and cross-sections shown on the Drawings.

3.3 EXCAVATING

- A. All excavations, trenching, and shoring shall comply with the rules and regulations as established by OSHA Construction Safety and Health Regulations 29 CFR, Part 1926, Subpart P, Excavation, Trenching and Shoring. Use OSHA Pamphlet 2226, Excavation and Trenching Operations, as an additional aid.

- B. Waste material may be encountered during excavation. Follow the requirements of Paragraph 3.3.Q for refuse excavation and handling.

- C. Appropriate health & safety measures shall be taken to protect all personnel from the hazards associated with excavation in a landfill. Any personnel associated with excavation, handling, loading, unloading, or otherwise exposed to landfill waste shall be HAZWOPER (OSHA 1910.120) trained and have current annual refresher.

- D. In excavations and trenches, proper allowances shall be made for pipe installation, formwork, concrete work, shoring, inspection, and any other work required in the excavation. Bottoms of excavations and trenches shall be level, clean, and clear of loose materials, trash, and debris.
- E. Protect bottoms of all excavations from free-standing water and frost. All soils in excavations or where fills will be placed shall be protected from movement or other damage due to frost penetration. Soil backfill, insulation, heat, or other methods acceptable to the Engineer shall be used to protect soils during periods of the year in which frost penetration is possible.
- F. Protect all excavations from surface water run-on and from erosion.
- G. Maintain functionality of all existing facilities.
- H. Materials, shoring and bracing needed to protect the work, adjacent structures and facilities and to ensure safe working conditions in the excavations are the responsibility of the Contractor. Vault or pit walls shall be shored until structure is completely constructed.
- I. Perform excavation of every description, regardless of the type, nature, classification, or condition of the material encountered, as specified, shown, or required to accomplish the construction.
- J. Excavated materials shall be hauled to designated stockpile(s) at the landfill.
- K. Proceed with excavation and disposal or stockpiling in an orderly manner that prevents the different materials from being mixed together during or after excavation.
- L. Limits of Excavation:
 - 1. Excavate to lines, grades, and dimensions, as shown on the Drawings, as directed by the Engineer, and as required to complete the Work.
 - 2. Minimize excavation beyond limits shown.
 - 3. Design and use sloping, sheeting, shoring, and bracing as necessary to protect existing landfill cells, roads, and structures from damage.
 - 4. Grade the surface of over-excavated areas by creating a smooth transition to adjoining areas, and slope to drain.
 - 5. Unauthorized over-excavation shall be replaced with the same fill material as specified for the overlying fill or backfill and compacted as required for such overlying fill or backfill. Correct all unauthorized over-excavated areas at the Contractor's sole expense.
- M. At the conclusion of each days work, all excavations shall be either backfilled, barricaded or adequately fenced and protected at a minimum to OSHA standards to avoid injuries to pedestrians, motorists and wildlife.

- N. Dewatering:
1. At all times during construction, provide ample means and devices to remove promptly and dispose of properly all water entering excavations and keep the bottom of the excavations firm and free of standing water until the structures to be built there are completed and/or the backfill to be placed there has been placed. The pumping and dewatering operations shall be carried out in such a manner that no disturbance to the foundation sub-grade materials or to fill materials supporting any other work shall result.
 2. Discharge of dewatering water shall be in accordance with the Contractor's Stormwater Pollution Prevention Plan (SWPPP) and the Contractor's Temporary Erosion and Sedimentation Control Plan (TESCP). Discharge of dewatering waters shall be undertaken such that no damage occurs to temporary or permanent drainage control features, and there is no unacceptable discharge of sediment off-site.
 3. Do not divert, remove or pump any groundwater, or water from any trench, manhole, or ditch without review from the Engineer.
 4. Excavation and site grading shall be performed in such a manner that the area of the site and the area immediately surrounding the site shall be continually and effectively drained by gravity or by temporary pumps.
 5. Water shall not be permitted to accumulate in excavations or adjacent to structure foundations.
 6. Excavations shall be drained by methods, which shall prevent wetting of the foundation bottom, undercutting of footings, or other conditions detrimental to proper construction procedures.
 7. Excavations shall be kept free of standing water during excavation and/or sub-grade preparation, and continually thereafter until the structure to be built or installed is completed.
 8. When failure to provide adequate dewatering and drainage causes disturbance or saturation of the soils below design foundation or excavation grade, dewater, excavate and refill the disturbed areas with properly compacted fill as directed by the Engineer. Such work is at the Contractor's expense and at no cost to the City.
 9. When water or sediments fill an area, including after rain events or the removal of soft or unstable materials, drain the area so that any backfill may be compacted. Drainage shall be accomplished prior to placing and compacting backfill. Remove all sediments from trench bottoms and structural excavations prior to placing backfill.
 10. The costs of pumping shall be incidental to and included in other items of work that apply.
 11. Surface Water Control: Provide surface water control in accordance with Section 02600- Surface Water Drainage.
 12. The excavation work for construction of the two side slope pump sumps (refer to the Drawings, including C-207, C-208, M-201, and M-202) may encounter groundwater; and would require dewatering for

proper construction of the sump liner system and the pump HDPE risers. The Contractor shall maintain dewatering operations at the two sumps until the Drain Layer Material has been installed. This work shall be incidental to work in this Section and included in Bid Item 2.

- O. Under no circumstances shall excavations be allowed within 2 feet horizontally of the geomembrane edge without acceptance by the Engineer. All such excavation shall be done with hand tools unless authorization is received in writing from the Engineer.
- P. Trench Excavation and Backfill: Follow the requirements of Section 02316.
- Q. Refuse Excavation and Haul:
 - 1. Refuse encountered during general site grading and excavation shall be excavated and replaced with Import Fill. The Engineer shall be notified immediately when refuse is encountered. Approval shall be received from the Engineer prior to excavating any waste material to achieve planned grades.
 - 2. Remove overlying cover soils. Do not excavate any refuse without prior review by the Engineer. Limit exposure and excavation of refuse to that which can be completed and backfilled within the working day. Backfill or cover any exposed refuse at the end of each working day with 6-inches of soil or 6-mil plastic sheeting. Dispose of excavated refuse in Cell 4 as directed by the Engineer and Landfill Operators.
 - 3. The Engineer shall be present at all times during refuse excavation. Upon excavation, the Engineer shall determine the type of waste. For the purposes of this project, waste shall be classified as potentially hazardous or mixed municipal waste. Potentially hazardous waste shall include soil or other material that may have been contaminated by petroleum products or other chemicals as indicated by staining, coloration, odors, or chemical storage drums. Mixed municipal waste shall be disposed in Cell 4. The Engineer shall coordinate the area for disposal with the City landfill operator. Potentially hazardous waste stockpiling and ultimate disposal shall be coordinated with ADEC by the City and the Engineer. The City will coordinate and pay for testing to determine suitability of potentially hazardous material for disposal. Extra payment will be made for handling, stockpiling, and disposal of potentially hazardous waste. The City will notify the Contractor of suitability of material for final disposal within twelve weeks of material placement in the potentially hazardous waste stockpile area. Final disposal could include placement within Cell 4 or off-site disposal at a properly permitted facility.
 - 4. Excavated waste / refuse shall be disposed in Cell 4. Coordinate all waste relocation to Cell 4 with the Landfill Operators.

- R. Disposal of Unsuitable and Surplus Material:
1. Haul all unsuitable and surplus material to the stockpile areas shown on the Drawings. Place unsuitable and surplus material in separate stockpiles within the designated stockpile area. If excavation yields more material than is incorporated into the work, stockpile the surplus in stockpile area shown on the plans in accordance with the Contract Documents and the Engineer's directions. Use ADOT "Standard Specifications for Highway Construction" – Section 305-3.01 for stockpile geometry guidelines.
- 3.4 PLACING AND SPREADING FILL MATERIALS
- A. Do not place fill until preparation of the underlying surface has been completed in accordance with these Specifications and has been accepted by the Engineer.
 - B. Place fill materials to the lines and grades shown on the Drawings with specified suitable materials.
 - C. Fill materials shall not be placed over wet, frozen, or unstable sub-grade surfaces.
 - D. Employ a placement method that does not disturb or damage underlying liner materials, foundations, foundation damp proofing or utilities in trenches.
 - E. For the Drain Layer Material over the Cells II-1 & II-2 Geomembrane refer to 3.1 (B) and 3.7 of this section for spreading and compaction requirements.
 - F. Place fill materials in lifts not exceeding 12 IN (uncompacted) for full width of the embankment and compact as specified before the next lift is placed. Use spreading equipment on each lift to obtain uniform thickness prior to compacting. Install the 12" imported fill layer (below the liner system) in max. 8" loose lifts prior to compaction. Maintain uniform density, during compaction. Add or remove water, as necessary, to obtain the required density. Route compaction equipment uniformly over the entire surface of each layer.
 - G. Construct all embankments and fills with moisture and density control unless the Engineer determines that such controls are not feasible.
 - H. Compaction with moisture and density control. Adjust the moisture content of the material to within 2% of the optimum moisture content and compact each layer to not less than 95% of the maximum dry density. Compaction of the shot rock shall be accomplished by a performance specification approved by the Engineer.
 - I. Grade in a manner that shall promote positive site drainage and that shall direct drainage away from the work and prevent ponding.

- J. Uniformly grade areas to provide a finished surface that is smooth, compacted and free of irregularities. Comply with compaction requirements and grade to cross sections, lines and elevations indicated.

3.5 QUARRY SPALLS

- A. Quarry spalls shall be placed in accordance with the Drawings and as directed by the Engineer.
- B. Quarry spalls shall be placed in such a manner that all relatively large stones are essentially in contact with each other and voids are filled with the finer materials to provide a well graded compact mass. Finished surface shall be free from irregularities.
- C. The stone shall be dumped or placed on the slope in a manner that will ensure the stone attains its specified thickness in one operation.
- D. When dumping or placing, care shall be used to avoid damaging the underlying material.
- E. Compaction shall be accomplished by drum-roller, excavator-mounted compactor, or approved equipment. The compaction effort shall be established by the Contractor and Engineer.

3.6 STRUCTURAL EXCAVATION AND BACKFILL

- A. Structure Excavation:
 - 1. Excavate subsoil required to accommodate structural foundations, slabs-on-grade and site structures.
 - 2. Extend excavations laterally from structure walls and footings a minimum of 2 FT to allow for clearance for observation and placement and removal of forms.
 - 3. Hand trim excavation. Remove loose matter, water softened sub-grade, lumped subsoil, boulders, and rocks.
- B. Support excavations in accordance with Section 02250 – Sheeting, Shoring, Bracing, and Sloping.

3.7 MATERIAL PLACEMENT OVER GEOMEMBRANES

- A. Drain layer materials shall be placed in one full thickness lift over the cushioning geotextile covering the geomembrane as shown on the plans.
- B. Remove all weighting materials prior to material placement.
- C. Refer to Section 3.1.B Equipment for Operating Above Geomembrane.

- D. The method of spreading and distributing material is the Contractor's responsibility. At a minimum, the Contractor shall follow the methodology described below:
 - 1. The spreading operation shall begin at the lower elevations and shall proceed either upslope or laterally at about the same elevation such that a full layer of material is always covering the geomembrane downslope from the area being covered.
- E. Where wrinkles occur, cover material shall be hand placed over the wrinkles to prevent movement and to prevent folding of the geomembrane or geotextile prior to the cover material being placed by heavier equipment.
- F. In operating equipment to place drain layer material, avoid sharp turns, sudden starts or stops, spinning and digging of tracks as a result of attempting to spread too large a load of material, or any other operation that could damage or displace the geomembrane, or geotextile. If the Engineer witnesses any spinning of equipment tracks during placement of materials, the Engineer may require the Contractor to remove materials by hand for inspection of the geomembrane. Removal, replacement, and any repair of materials are at the Contractor's expense.
- G. The cover materials shall be hand placed above leachate and underdrain pipes to prevent movement and to prevent damage to pipes.
- H. Cover materials shall not be placed in direct contact with any geomembrane. In all cases, the geomembrane shall be protected from direct contact with drain layer material by a protective layer of Cushioning Geotextile as shown on the Drawings.

3.8 CELLS II-1 AND II-2 SUBGRADE SURFACE TOLERANCES

- A. Survey Precision: The Contractor will provide survey control for soil placement and excavation precise to plus or minus 0.1 FT vertically and plus or minus 0.5 FT horizontally. The Contractor shall provide survey checks for final re-graded surfaces for each surface encountered prior to placing more materials.
- B. Top Surface Tolerance: Finished sub-grade surfaces shall be within plus or minus 0.1 FT from required elevations.

3.9 QUALITY CONTROL

- A. Field Conformance Testing:
 - 1. The Engineer will perform in-place density tests.
 - 2. Materials will be sampled and tested by the Contractor for conformance with the specified material properties in accordance with the following standards and frequencies:
 - a. Import Fill:

- 1) Gradation (AASHTO T 27/T 11) and Plasticity (AASHTO T 98 and T 90): 1 per 10,000 cy.
 - 2) Moisture Density Relationship (ASTM D1557 C): 1 per 10,000 cy.
 - b. Drain Layer Material:
 - 1) Gradation (ASTM C117 and C136): 1 per 10,000 cy.
 - 2) Permeability (ASTM D2434)
 - c. D-1 Surface Course:
 - 1) Gradation (ASTM C117 and C136): 1 per 10,000 cy.
 - 2) Moisture Density Relationship (ASTM D1557 C): 1 per 10,000 cy.
 - d. Liner Foundation Material:
 - 1) Gradation (ASTM C117 and C136): 1 per 10,000 cy.
 - 2) Moisture Density Relationship (ASTM D1557 C): 1 per 10,000 cy.
 3. The Engineer, depending on the consistency of the materials and results, may amend the conformance-testing frequency in consultation with the Design Consultant.
- B. Options for Failed Tests:
1. Moisture content: Re-test in the same area. If second test fails, remove or rework area defined within limits by other tests meeting criteria.
 2. In-place density: Re-compact and re-test same area. If second test fails, remove or rework area defined within limits by other tests meeting criteria.

END OF SECTION

SECTION 02316 - TRENCH EXCAVATION AND BACKFILL

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Excavation, dewatering, foundation, bedding, and backfilling of trenches for piping systems and structures.
- B. Referenced Standards: This section incorporates by reference the latest revision of the following documents. It is part of this section as specified and modified. In case of conflict between the requirements of this section and that of the listed documents, the requirements of this section shall prevail:
 - 1. American Society for Testing and Materials (ASTM):
 - a. D698: Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
 - b. D1557: Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).
 - c. D1586: Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils.
 - d. D2166: Standard Test Method for Unconfined Compressive Strength of Cohesive Soil.
 - e. D2321: Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
 - f. D2487: Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).
 - g. D2573: Standard Test Method for Field Vane Shear Test in Cohesive Soil.
 - h. D2922: Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
 - i. D3017: Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
 - j. D4254: Standard Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.

1.2 DEFINITIONS

- A. Trench Backfill Material: For piping systems, that material placed above the bedding zone to the existing or proposed sub-grade.
- B. Pipe Bedding Material: material placed in contact with the pipe (and immediately adjacent to) for the purpose of providing structural support to the pipe and, in some cases, a porous region for transfer of gas/fluids into the

pipng system. Pipe bedding material is classified into 3 zones of placement as follows:

1. Bedding: That material placed from the bottom of the bedding zone to the bottom of the pipe itself.
2. Haunching: That material placed from the bottom of the pipe to the springline of the pipe.
3. Initial Backfill: That material placed from the springline of the pipe to the top of the bedding zone.

- C. Sub-grade: The surface prepared to accept other materials.
- D. Unstable trench bottom: A condition that does not provide adequate support and stable containment of the bedding material. Unstable conditions include a soft trench bottom that does not provide an adequate working platform or walls that readily slough. Unstable conditions also include materials with high organic content, fine grained soils saturated with water in excess of their liquid limit, low density fine sands or silts, and expansive soils such as "fat" clays and certain shales that exhibit a large change in volume with change in moisture content.
- E. In situ soil is considered stable (for cohesive or granular cohesive soils), if the shear strength as measured in accordance with ASTM D-2166 or ASTM D-2573 is not less than 500 lbs/ft².
- F. In situ soil is considered stable (for sands), if the penetration resistance as determined in accordance with ASTM D-1586 is not less than 8 blows per foot.

1.3 SUBMITTALS

- A. Submit in accordance with provisions of Section 01300, Project Data Submittals, and Section 2.4 of these Specifications.
- B. Submit samples of proposed synthetic and soil materials to be used in construction, whether excavated and processed from materials on site or imported, for testing. Submit samples of sufficient size, quantity, and frequency, as determined by the Engineer.
- C. Submit a plan showing trench construction sequence and schedule. Provide the shoring submittal and details per Section 02250, Subsection 1.4.
- D. Where dewatering is necessary, submit a plan for controlling site water as specified herein and in Section 02300 - Earthwork.
- E. Submit soil material testing results as required in this Section.

1.4 PROTECTION

- A. All streets, roads, grading, structures, utilities and other improvements not specifically designated to be cleared, removed, stripped or altered as a part of the work shall be protected from damage throughout the construction period. Any damage caused by the Contractor, his employees, agents, or any lower tiered subcontractors shall be immediately repaired to the original condition and to the satisfaction of the Engineer at no additional cost to the City. Completed work (e.g. earthwork and foundations) shall be protected from wetting, drying and freezing by providing temporary drainage features and blankets or protective cover soil layers as necessary.
- B. Existing Utilities:
1. Known existing utilities shall be indicated in the Construction Plan and on the Drawings. Hand excavate all excavations within 2 FT of areas where existing utilities are indicated, unless directed otherwise by the Engineer.
 2. Verify the actual locations of all existing utilities within the excavation area through the use of a qualified utility location services firm and by hand excavation.
 3. Record the utility locations on the Record Drawings.
 4. After the actual locations and routing of the existing utilities have been found to be accurately determinable through this hand excavation, and after approval from the Engineer, excavation may begin using machinery in a manner acceptable to the Engineer.
 5. After excavation by machinery has begun, the Contractor is fully responsible for all utilities found through the location services; by hand excavation and/or which were indicated on the Drawings.
 6. Any existing utility indicated in the Construction Plan and on the Drawings that is damaged shall be immediately repaired in a manner acceptable to the Engineer or Utility and at no additional cost to the City.
 7. If excavation or other work will be within ten feet of any existing electrical utility either above or below ground, Lockout/Tagout is required. Provide 24-hour prior notice to the Engineer of planned excavations of this type. Coordinate with the City and the applicable utility companies to arrange for and perform this Lockout/Tagout.
 8. Notify the Engineer immediately if any existing utilities, which were not indicated, are encountered during excavation.
 9. Obtain approval from the Engineer before backfilling existing utilities. Utility warning tape shall be placed 12 IN above existing utilities.
 10. Excavate and clean the existing liner / cover systems as required to establish sub-grade and make continuous connections between proposed liner and the existing Cell 3 liner as shown on the plans. The approximate limits of this excavation are indicated on the plans, however, the locations are approximations, and as such, it is the

responsibility of the Contractor to locate and expose the existing liner and to adjust the required excavation as reviewed by the Engineer. Equipment and methods shall be utilized to protect the integrity of all lining materials. The Engineer may inspect for damage at any time. Repair damage as directed by the Engineer and modify construction methods to prevent further damage. Damage to existing liner / cover systems, in the opinion of the Engineer, caused by the Contractor's excavation over or adjacent to the existing liner / cover shall be repaired at the Contractor's expense.

11. Do not excavate or operate equipment within 5 FT of any monitoring wells or probes. Damaged wells or probes will be replaced at the sole expense of the Contractor.

1.5 REGULATORY REQUIREMENTS

- A. Permits: Obtain and comply with the appropriate local, state, and federal permits and licenses required for transporting affected soil to the selected disposal site.
- B. Manifests/Bills of Lading: Contractor is responsible for completing manifests, bills of lading, or similar documentation for all wastes transported from the site.

PART 2 - PRODUCTS

2.1 PIPE BEDDING

- A. Piping above the liner system: Unless otherwise noted, pipe bedding shall meet the requirements for Drain Layer Material as specified in Section 02300 – Earthwork, 2.1, and as shown on the Drawings.
- B. Piping below liner system: Unless otherwise noted, pipe bedding for perforated pipes shall meet the requirements for Drain Layer Material as specified in Section 02300 – Earthwork, and as shown on the Drawings. Pipe bedding for solid pipes shall meet the requirements for D-1 Aggregate as specified in Section 02300 – Earthwork, and as shown on the Drawings.
- C. Piping beyond liner limits: Unless otherwise noted, pipe bedding material shall meet the requirements for D-1 Aggregate unless otherwise noted on the Drawings.

2.2 TRENCH BACKFILL MATERIAL

- A. Trench Backfill Material shall be D-1 Aggregate Import Fill as specified in Section 02300 – Earthwork, and as shown on the Drawings.

2.3 DETECTABLE WARNING TAPE

- A. Detectable warning tape shall be 50 mm (2 IN) wide flexible tape, printed on one side with the words “Danger, Utility Line Buried Below” as appropriate and shall be detectable by standard pipe locating means. Tape shall be Alert Line, Type-3A, as manufactured by Line Tech, Inc., Schaumburg, IL. Provide continuous tape over the vertical centerline of the pipe or conduit as shown on the Drawings.

2.4 SOURCE QUALITY CONTROL

- A. Material testing of soils used for foundation, bedding, and trench backfill material shall be performed to ensure the consistency of the properties of the soil obtained from on or off-site borrow sources. These tests shall be performed prior to processing, placement, compaction and any necessary conditioning. At a minimum, the quality control conformance tests in Section 02300 - Earthwork shall be conducted.
- B. Results of the source quality control tests are to be provided to the Engineer.

PART 3 - EXECUTION

3.1 GENERAL

- A. Equipment:
1. All equipment and tools used in the performance of this work are subject to the review of the Engineer before work is started.
 2. Provide compaction equipment appropriate for the material types to obtain the densities specified.
 3. Provide hand-operated compaction equipment in areas closer than 2 feet from structures to obtain the densities specified.
 4. Operate and maintain compaction equipment in accordance with the manufacturer’s instructions and recommendations. If inadequate densities are obtained, provide larger and/or different type equipment at no additional cost to the City.
 5. Provide equipment for applying water of a type and quality adequate for the Work, free of leaks and equipped with a distributor bar or other approved device to ensure uniform application.
 6. Provide equipment for mixing and drying out material, such as blades, discs, or other approved equipment.
- B. Verification of Conditions:
1. Verify all lines, limits and grades prior to beginning construction activities.
 2. Verify all utility locations per Drawings, historical drawings, locate service, etc.

3.2 PREPARATION

- A. Clearing, Grubbing, and Stripping:
 - 1. All Clearing, Grubbing, and Stripping activities shall be performed in accordance with Section 02230 of the Specification.

3.3 DEWATERING

- A. Provide dewatering of trenches in accordance with Section 02300 – Earthwork.
- B. No additional compensation shall be made for materials used for trench drainage.

3.4 EXCAVATION

- A. General:
 - 1. Excavation consists of removal of all types of material encountered when establishing required sub-grade elevation, trench dimensions and adequate support for elevations, grades and alignment as shown on the Drawings.
 - 2. The variety of refuse disposed of within the landfill site is unknown. The estimated limits of refuse are the existing cell limits shown on the Drawings, however, refuse may be encountered outside the limits shown. When it is necessary to excavate into refuse in order to perform any of the work, the Contractor's Health and Safety Plan shall be strictly followed during excavating, handling, and disposing of the refuse, and whenever working in proximity to refuse. The Contractor is cautioned of the possibility of encountering potentially harmful gases, liquids or wastes. Work near refuse may encounter harmful gases, liquids, and soil even if refuse is not found.
 - 3. Unauthorized excavation consists of removal of materials beyond the trench limits, indicated sub-grade/grade or finished elevations or dimensions without specific direction of the Engineer. Unauthorized excavation, as well as remedial work directed by the Engineer, shall be at Contractor's expense.
 - 4. Remedial Work for Unauthorized Excavation:
 - a. Backfill and compact unauthorized excavations with import fill, as determined by the Engineer. Compact to a density not less than that specified for the subsequent materials layers.
 - 5. Excavation shall not encroach within a normal 45 degree bearing splay of adjacent structure foundations or roadways. Underpin adjacent facilities that may be damaged by excavation work, including utilities and pipe chases.
 - 6. Material that is part vegetation soil, surfacing, or cover system (such as gravel, pavement, topsoil, and/or barrier soil), shall be separated from other excavated material wherever possible. Such material shall

- be removed in a manner to separate it clearly from underlying material and shall be stored or disposed of, on the site where directed by the Engineer.
7. Grade top perimeter of excavation to prevent surface water from draining into excavation.
 8. Stockpile excess excavated unprocessed material at locations indicated on Drawings or as directed by the Engineer.
 9. All necessary precautions to protect underground piping during the course of the construction shall be taken.
 10. Schedule all road crossings with City Operations staff to minimize disruption to waste disposal operations and traffic.
 11. Appropriate health & safety measures shall be taken to protect all personnel from the hazards associated with excavation in a landfill. Any personnel associated with excavation, handling, loading, unloading, or otherwise exposed to refuse shall be HAZWOPER (OSHA 1910.120) trained.
 12. Cut trenches sufficiently wide to enable installation of the utilities and allow inspection. Normal trench width below the top of the pipe shall be the nominal pipe diameter plus 24 inches. Do not undercut trench walls.
 13. If unstable conditions are encountered, excavate below grade to such depth and width as directed by the Engineer. The excavated area below grade shall be filled with Drain Layer Material in 6 inch compacted layers and brought up to within 6 inches of the bottom of the pipe.
 14. Dispose of excavated refuse to the working face a minimum of twice per day.
- B. Trench Excavation:
1. Walls of trenches below the elevation of the crown shall be maintained as vertical as possible. Where the trench excavation exceeds a depth of 4 feet, the trench walls shall be sloped or structurally retained with trench boxes or sheeting, shoring, bracing, and sloping systems in accordance with Section 02250 – Sheeting, Shoring, Bracing, and Sloping.
 2. Excavation into refuse may require surface water/leachate diversion and groundwater/leachate removal and disposal. Prior to any dewatering, a plan for controlling site water shall be submitted for review by the Engineer. The plan shall include the installation methods and details of the proposed water control system and intended disposal methods for contaminated groundwater/leachate collected during dewatering. Dewatering activities shall be performed in accordance with the Contractor's Health and Safety Plan.
 3. Hand trim excavation. Remove loose matter; water softened sub-grade, lumped subsoil, boulders, and rocks.

4. Do not excavate more trench than can be completely inspected, corrected (if required) and backfilled in one day. Excavations shall not be left open after work has stopped for the day.
- C. Support excavations in accordance with Section 02250 – Sheeting, Shoring, Bracing, and Sloping.

3.5 BEDDING THE PIPE

- A. Minimum thickness for pipe bedding under the pipe shall be 6 inches unless otherwise shown on the Drawings. Hand grade and compact each lift of bedding material to provide a firm, unyielding surface. Check grade and correct irregularities in bedding material. Loosen top 1 to 2 inches of compacted bedding material with a rake or by other means to provide a cushion before laying each section of pipe. Max lift thickness for installing bedding shall be 8”.
- B. Excavate in bedding at each pipe connection to permit proper assembly and inspection of connection and to provide uniform bearing along barrel of pipe. Install to form continuous and uniform support.
- C. Restrain pipe as necessary to prevent movement of the pipe during backfill operations. Thickness of pipe zone above pipe crown is 12 inches.
- D. Place bedding material simultaneously in lifts on both sides of pipe and, if applicable, between pipes installed in the same trench. First lift shall be less than or equal to 1/2 pipe diameter for pipes 10 inches and smaller in diameter.
- E. Thoroughly tamp each lift, including area under haunches, with handheld tamping bars supplemented by “walking in” and slicing material under haunches with a shovel to ensure that voids are completely filled before placing each succeeding lift.
- F. After the full depth of the material has been placed as specified, compact the material by a minimum of three passes with a hand-held jumping jack or vibratory plate compactor only over the area between the sides of the pipe and the trench walls.
- G. Pipe joining and placement is specified in Section 02614 – HDPE Pipe and Fittings.
- H. Install detector tape per manufacturer instructions per paragraph 2.3.

3.6 BACKFILLING TRENCHES

- A. General:
 1. Prior to initiating placement of foundation, bedding and trench backfill material, submit to the Engineer: mechanical equipment to be used for

- compaction; techniques for appropriate moisture conditioning; verification of trench bottom grade and alignment.
2. Trench backfill material shall be moisture conditioned as required to obtain specified compaction, placed in loose layers no greater than 12 inches, and compacted to the specified density for various locations in accordance with this Section, Compaction 3.8.
 3. Do not allow backfill to free fall into the trench or allow heavy, sharp pieces of material to be placed as backfill until after at least 2 feet of backfill has been provided over the top of pipe.
 4. Do not use power driven roller impact type compactors for compaction until at least 3 feet of backfill is placed over top of pipe.
 5. Backfill around structures as specified for adjacent trench unless otherwise shown or specified.
 6. Place detectable warning tape in the location shown on the Plans. Tape shall be installed in all pipe trenches unless noted otherwise on the Plans. Label tape to identify material that will flow through pipe: Stormwater, Leachate, etc.
 7. Excess native backfill material shall be stockpiled or disposed of onsite as directed by the Engineer.
 8. Do not backfill over wet, frozen or spongy sub-grade surfaces.
 9. Backfill trenches to contours and elevations with unfrozen materials.
 10. Maintain optimum moisture content of backfill materials to attain required compaction density.

3.7 SUB-GRADE AND FINISHED GRADES

- A. All areas covered by the work, including excavated and filled sections, shall be uniformly backbladed to the sub-grade or finished ground elevations. The finish surface shall be reasonably smooth and free of irregularities.
- B. Areas where excavation disrupted a surface system such as vegetation soil, surfacing, pavement or cover system (such as topsoil, gravel, asphalt, and/or barrier soil), shall be restored to the original surfacing.

3.8 COMPACTION

- A. General: Compact soils to not less than 95% of maximum dry density in accordance with ASTM D698 unless otherwise indicated on the Drawings or unless stated below:
 1. In roads, structural berms, or below ditches (existing or proposed roads), place any trench backfill and structural backfill materials in 8 IN maximum lifts and compact to 95% of the maximum dry density as determined using the Modified Proctor in accordance with ASTM D1557.
 2. In other areas, place trench backfill in 12 IN maximum lifts and compact to 95% of the maximum dry density as determined using the Modified Proctor in accordance with ASTM D1557. In areas where

- shot rock, or other larger materials are used; a performance specification will be developed by the Engineer and Contractor.
3. Compaction testing requirements for materials used for trench backfill shall be per the requirements for the material used as defined in Section 2300 - Earthwork.

- B. Sub-grades: Unless otherwise noted, compact top 6 inches of sub-grade to density not less than required for the subsequent layer of fill/backfill material.

3.9 TOLERANCES

- A. Top Surface of Sub-grade: In accordance with Section 02300 – Earthwork, for the relevant subgrade surface.
- B. Top Surface of General Backfilling: Plus or minus one inch from required elevations.

3.10 MAINTENANCE OF TRENCH

- A. After each section of trench is backfilled, maintain the surface of the backfilled trench even with the adjacent ground surface until final surface restoration is completed.
- B. Settlement of trench backfill, or of fill or facilities constructed over trench backfill will be considered a result of defective compaction of trench backfill.

3.11 SURFACE RESTORATION

- A. After each section of the trench is completed, the surface shall be restored to its original condition:
 1. Gravel roadway surfaces disturbed during construction shall be restored with crushed surfacing top course.
- B. No separate payment will be made for clearing and grubbing, protection of existing utilities, utility crossings, trench excavation, shoring, dewatering (if required), dewatering water disposal, placement of backfill, compaction of backfill material; placement and removal of temporary cover; and detectable warning tape. These items shall be considered incidental to the work of constructing the pipes, and all costs thereof shall be included in the lump sum contract price for the pipe of the kind and size specified.

3.12 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed by the Engineer.
- B. Alignment and grade control:
 1. Grade and alignment control shall be provided by the Contractor during excavation of trenches. Stakes or similar devices that display relevant information to control work shall be provided. Grade control

devices shall be spaced no greater than 6 meters (20 feet) apart over the entire length of trench and at critical grade breaks or changes in alignment.

2. The Contractor will provide grade control device showing trench top and bottom of bedding layer design elevation, depth and existing elevation. Excavation of material shall be monitored to verify grade and alignment tolerances are met.
3. New grade markers to replace any that have been disturbed shall be re-set by the Contractor.

C. Compaction Control:

1. The Engineer will conduct in-place density and moisture content testing in accordance with Section 02300 – Earthwork, Subsection 3.9.A – Field Conformance Testing.

3.13 SUB-GRADE ACCEPTANCE

- A. The sub-grade shall be accepted by the Engineer when:
1. Conformance test results meet the requirements of the Contract Documents.
 2. Required documentation from the field and testing laboratories has been received and accepted.
 3. All repairs have been completed to the satisfaction of the Engineer and at no cost to the Owner.
 4. Written certification documents, including as-built drawings have been received by the Engineer.

END OF SECTION

SECTION 02370 - EROSION AND SEDIMENTATION CONTROL

PART 1 - GENERAL

1.1 SUMMARY

- A. The Work will fall under the ACGP as it is a publically owned construction project which will impact at least 1 acre.
- B. Section includes performance specifications of the materials and methods for controlling erosion, sedimentation, discharge of storm and construction dewatering water, fugitive dust, and fugitive gas during the Work.
- C. The cost of implementation of the ACGP into the Work, BMP structures employed by the Contractor but not listed in this Specification, construction dewatering, and water filtration are considered incidental to the Work and no separate payment or additional compensation will be made for them.

1.2 REFERENCES

The publications listed herein form part of this Specification to the extent applicable. The publications are referred to in the text by basic designation only. The most recent version of the publication shall be applicable in all cases. Refer to the ADEC Division of Water website for application instructions and ADEC references:

<http://dec.alaska.gov/WATER/wnpssc/stormwater/index.htm>

- 1. ADEC Alaska Construction General Permit AKR100000
- 2. ADEC ACGP Permit No. AKR100000 Fact Sheet
- 3. ADEC ACGP SWPPP Template
- 4. ADEC ACGP SWPPP Appendices
- 5. ADEC ACGP SWPPP Completion Checklist
- 6. ADEC SWPPP Development Resources
- 7. ADEC Fact Sheet about the 2011 ACGP (AKR100000)
- 8. 18 AAC 72 Wastewater Disposal
- 9. 18 AAC 83 Alaska Pollutant Discharge Elimination System
- 10. ADEC Division of Water Alaska Storm Water Guide December 2011
- 11. ADEC Excavation Dewatering GP 2009DB0003
- 12. Contractor's project-specific SWPPP

1.3 DEFINITIONS

- A. Alaska Administrative Code (AAC): Refers to laws of the State of Alaska which contain the regulations of the various State of Alaska agencies.

- B. Alaska Construction General Permit (ACGP): Refers to Permit No. AKR100000 which is the ADEC general permit for discharges from large and small construction activities. The permit authorizes and sets conditions on the discharge of pollutants from construction projects to waters of the United States. In order to ensure protection of water quality and human health, the permit describes control measures that must be used to control the types and amounts of pollutants that can be discharged from construction activities.
- C. Alaska Department of Environmental Conservation (ADEC): Refers to the State of Alaska agency charged with conserving, improving and protecting Alaska's natural resources and environment to enhance the health, safety, economic and social well-being of Alaskans.
- D. Alaska Certified Erosion and Sediment Control Lead (AK-CESCL): Refers to a storm water training program created by the Alaska Storm Water Steering Committee to enhance compliance with the requirements of the ACGP.
- E. Best Management Practice (BMP): BMPs include a wide range of project management practices, schedules, activities, or prohibition of practices, that when used alone or in combination, prevent or reduce fugitive dust, erosion, sedimentation, and/or pollution of adjacent water bodies and wetlands. BMPs include temporary or permanent structural and non-structural devices and practices such as temporary or permanent erosion and sediment controls.
- F. Construction Quality Control (CQC): Refers to those actions taken by the Contractor (including those parties charged with the manufacture, supply, fabrication, delivery, and installation) to demonstrate and sometimes quantify the characteristics of the product. The results of the CQC program are compared to the Specifications and any other contractual or regulatory requirements. During each aspect of the Work, quality control shall be provided by the Contractor to ensure and document that the materials and workmanship conform to the Drawings and Specifications.
- G. Construction Quality Assurance (CQA): Refers to those actions (including observations, verifications, audits, testing and evaluation), taken by the Engineer on behalf of the City, intended to provide adequate confidence that the materials and workmanship provided by the Contractor conform to the Drawings and Specifications and any applicable regulatory requirements.
- H. Electronic Notice of Intent (eNOI). Refers to notice of intent to commence ground disturbing activities under the ACGP.
- I. Electronic Notice of Termination (eNOT): Refers to notice of intent to cease ground disturbing activities under the ACGP.

- J. Final Stabilization: A point in time when all ground-disturbing activities are complete and permanent erosion and sediment controls shown in the Drawings and the SWPPP are established and functional. The stabilized site is protected from erosive forces of raindrop impact and water flow.
- K. Storm Water Pollution Prevention Plan (SWPPP): Refers to the Contractor's plan for erosion and sediment control and storm water management under the ACGP. The SWPPP is developed and implemented by the Contractor and describes site-specific BMPs identified for the Work.

1.4 SUBMITTALS

- A. All submittals shall be in accordance with Section 01300.
- B. Contractor shall submit a draft eNOI and a project specific SWPPP at least 45 days prior to start of Work. The SWPPP shall be prepared in accordance with the references listed in Section 1.2 and with Section 1.5 of this Specification. Ground disturbing Work shall not commence until the Engineer has reviewed and taken no exceptions to the SWPPP, all ADEC acknowledgements are in order, and the SWPPP and BMPs have been physically posted and implemented at the Site.

The SWPP shall also include detailed plans and specifications for following the ACGP permit conditions for construction dewatering and storm water discharge as conditions require. The plans and specifications shall also be in accordance with the related requirements of Section 02230, Section 02300, and Section 02316.

- C. Prior to start of ground disturbing Work the Contractor shall submit the AK-CESCL certification or certifications for designated SWPPP lead described in Section 1.5 of this specification. The submittal shall also specify the line of authority and designate the field representative for implementing SWPPP compliance.
- D. Prior to shipping BMP material to the site, the Contractor shall submit to the Engineer the manufacturer product specifications, installation recommendations, and the Contractor's proposed construction methods for the materials, equipment and activities listed or added to the SWPPP as BMPs. The submittal shall include a neat legible site plan showing proposed locations.
- E. Within 7 days of each inspection the Contractor shall submit the SWPPP inspection report and a certification that the site is in compliance with the SWPPP. Include amendments to the SWPPP made to correct problems identified in the inspection or inspections.
- F. After completion of the Work and Final Stabilization the Contractor shall submit the project eNOT and evidence of acknowledgment from ADEC within the time frame specified in the ACGP.

1.5 STORM WATER POLLUTION PREVENTION PLAN

- A. Under current ADEC regulations, the City intends to delegate authority to the Contractor for SWPPP compliance after the City has reviewed the Contractor's SWPPP and draft eNOI submittal. The City will then submit the City eNOI and delegation forms to ADEC. Following the City submittal the Contractor will then submit their own eNOI, any other required documentation to ADEC, and pay all required fees. The Contractor is responsible for terminating the eNOI at the conclusion of the Contract with an eNOT. The City will terminate the City eNOI following the Contractor's termination.
- B. For the duration of the Contract, the Contractor will be responsible to comply with all requirements of the AGCP, implement all temporary and permanent erosion and sediment control measures (BMPs) identified in the SWPPP, ensure that the SWPPP remains current, maintain all temporary and permanent erosion and sediment control measures in effective operating condition. The City reserves the right to perform due diligence including requiring co-inspections through their CQA program.
- C. For the duration of the Contract, the contractor is responsible to provide an on-site AK-CESCL trained person with operational control over implementation of the SWPPP.
- D. The SWPPP shall include construction details and locations of the necessary BMPs including but not limited to those items listed in this Specification.
- E. The SWPPP shall include, as a minimum:
 - 1. All of the site specific controls and other elements required in the ADEC ACGP SWPPP Template and Appendices listed in Section 1.2 of this specification; and
 - 2. Statement that the Contractor is responsible for the coordination of the work of all trades.

1.6 INSPECTIONS, MAINTENANCE, AND RECORDKEEPING

- A. Prior to start of Work, conduct a joint on-site inspection with the Engineer and the Contractor's AK-CESCL to discuss the implementation of the SWPPP.
- B. Contractor shall inspect BMPs in the manner and frequency as required in the ACGP and the SWPPP.
- C. As conditions warrant the Contractor shall immediately repair, replace, or add BMPs as required to meet the conditions of the ACGP and the SWPPP.
- D. Contractor shall continue inspections and maintenance operations during periods of work stoppages or until Final Stabilization has been completed as per these Specifications, the Drawings, and the SWPPP.

- E. Contractor shall keep and maintain SWPPP records onsite throughout construction activity and maintain these records in a manner and duration required in the ACGP and SWPPP. This requirement includes provision of records at the request of ADEC within the post eNOT record retention period of time specified in the ACGP.
- 1.7 QUALITY ASSURANCE AND QUALITY CONTROL
- A. The Contractor shall perform the Work in accordance with Article 12 – General Conditions.
 - B. Contractor shall be responsible for CQC. Contractor shall engage and pay for the services of qualified staff or a qualified subcontractor to perform CQC for monitoring and documenting the quality of the SWPPP, performance of BMPs, and SWPPP implementation in accordance with these Specifications.
 - C. The Contractor shall accommodate and provide support for CQA activities described in this Specification.
 - D. Any Work that does not satisfy the requirements of the Drawings and these Specifications shall be made good in accordance with the requirements of the Specification or as directed by the Engineer at the sole expense of the Contractor.

PART 2 - PRODUCTS

- 2.1 EROSION CONTROL MATTING, TURF REINFORCEMENT MATTING AND COCONUT FIBER MATTING
- A. Erosion Control Matting, shall conform to Section 02376 – Rolled Erosion Control Products.
- 2.2 SILT FENCE
- A. Geotextile for silt fences shall be purchased in a continuous roll cut to the length of the barrier to avoid joints. If necessary, joints shall be constructed only at support posts and by splicing the geotextile together, with a minimum 6-inch overlap, and securely fastening both ends to the post.
 - B. Silt fence geotextile shall consist of a material specifically sold as silt fence and may be prefabricated with appropriate posts to facilitate installation.
 - C. Silt fence geotextile material shall meet the requirements of Table 1.

TABLE 1 GEOTEXTILE FOR TEMPORARY SILT FENCE			
GEOTEXTILE PROPERTY	TEST METHOD	GEOTEXTILE PROPERTY REQUIREMENTS	
		UNSUPPORTED BETWEEN POSTS	SUPPORTED BETWEEN POSTS WITH WIRE OF POLYMERIC MESH
AOS for silt	ASTM D4751	.60 mm max. for slit film wovens (#30 sieve) .30 mm max. for all other geotextile types (#50 sieve) .15 mm min (#100 sieve)	.60 mm max for slit film wovens (#30 sieve) .30 mm max. for all other geotextile types (#50 sieve) .15 mm min (#100 sieve)
Water Permittivity	ASTM D4491	.02 sec – 1min.	.02 sec – 1min.
Grab Tensile Strength, min. in machine and x-machine direction	ASTM D4632	180 lbs. min. in machine direction, 100 lbs. min. in x-machine direction	100 lbs. min.
Grab Failure Strain, min. in machine direction only	ASTM D4632	30% max. at 180 lbs. or more	
Ultraviolet (UV) Re-Radiation Stability	ASTM D43556	70% Strength Retained min., after 500 hrs. in weatherometer	70% Strength Retained min., after 500 hrs. in weatherometer

- D. Steel or wood posts, to support silt fence, shall be installed accordance with Manufacturer’s instructions and the Alaska Storm Water Guide.

2.3 STRAW BALES AND STRAW WADDLE

- A. Straw bales and waddle shall be tied with wire or plastic.
- B. The Straw shall be free of noxious weeds and reed canary grass seeds.
- C. Straw bale and waddle check dams shall be fabricated by staking 2 or 3 straw bales or waddles across a perimeter surface water drainage ditch.

- D. Straw bale or waddle barriers shall be fabricated by staking 3 or more straw bales or waddles across a surface water flow path. Straw bale or waddle barriers shall be constructed at the entrance to all surface water culverts.
- 2.4 DUST PALLIATIVE
- A. Dust palliative shall consist of a biodegradable material specifically sold as a dust suppressant and approved by the Engineer.
- 2.5 SANDBAGS
- A. Sandbags shall be constructed of material that is resistant to UV light degradation for a minimum of 2 years.
- 2.6 TEMPORARY COVER
- A. Temporary Cover shall include, but not be limited to:
 - 1. Erosion Control Matting in accordance with Section 02376 – Rolled Erosion Control Products.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

- A. Nothing within the SWPPP, the Drawings, or these Specifications shall relieve the Contractor from complying with other Contract requirements.
- B. The Work defined by this Specification shall include, but not be limited to:
 - 1. The furnishing and delivery of all required materials; and
 - 2. The installation and maintenance of all BMPs within the Construction Limit shown on the Drawings.
- C. If sediment-laden water, leaves the Construction Limits, the Engineer shall consider the existing erosion control measures to be inadequate. Contractor shall be required to complete additional maintenance and/or construct additional erosion and sediment control facilities.
- D. The Contractor shall not allow the area of work to exceed his ability to adequately prevent sediment from leaving the Construction Limits.
- E. All elements of the Contractor's SWPPP implementation shall comply with the requirements of the ACGP.
- F. When, in the opinion of the Engineer, temporary erosion and sedimentation control devices are no longer needed, the Contractor shall remove them and finish the areas in accordance with the Drawings and Specifications.

- G. Contractor shall brief all employees and subcontractors working on the site about the project SWPPP. The briefing shall include, but not be limited to:
 - 1. BMP system maintenance;
 - 2. Spill prevention practices, spill response, and cleanup procedures; and
 - 3. The importance of BMPs, including details of the BMPs to be incorporated in the Work.

3.2 TEMPORARY SURFACE WATER CONTROL SYSTEM

- A. Contractor shall construct temporary surface water diversion ditches to protect all open trenches or excavations from stormwater runoff and runoff.
- B. All pumps and temporary storage tanks used as part of the temporary stormwater control system shall be adequately designed and operated during storm event to prevent off-site migration of storm water or materials from within the Construction Limits.
- C. During construction, the Contractor shall maintain adequate drainage conveyance features downstream of the construction area to provide controlled conveyance of runoff. The Contractor shall repair any damage to existing and constructed landfill features that, in the opinion of the Engineer, are a result of failure to provide proper construction period drainage features.

3.3 CONSTRUCTION OPERATIONS

- A. Contractor shall construct and install all BMPs and shall fully stabilize all graded and disturbed areas in accordance with the SWPPP, the Drawings and these Specifications and as designated by the Engineer.
- B. BMP measures shall remain in operation until installation of all features is completed and accepted. Final Stabilization shall be completed prior to the removal of temporary erosion and sedimentation control measures.
- C. Contractor shall limit construction operations to the area within the Construction Limits as shown on the Drawings. Any areas outside the Construction Limits that are disturbed without the express direction of the Engineer shall be stabilized at the sole expense of the Contractor. The Contractor is responsible for their own ACGP compliance on all related off-site locations such as quarries, stockpile locations, etc.
- D. The Contractor shall maintain good housekeeping practices for the duration of the Work, especially with the use of oils, fuel, and chemicals. The use of oil, fuel and chemicals during construction shall comply with the requirements of the SWPPP and all other local state, and federal regulations.

3.4 MAINTENANCE

- A. Contractor shall maintain, clean and remove all sediment and debris from permanent surface water facilities, including all catch basins, manholes, and pipes within the construction limits no less than once per month.
- B. Contractor shall maintain, clean and remove sediment from all BMP structures no less than once per month.
- C. Contractor shall repair and maintain BMPs that are within the Construction Limits and are to form part of either the temporary or permanent erosion controls for the Work.

3.5 DUST CONTROL

- A. The requirements for dust control documented in the approved SWPPP shall be implemented by the Contractor for the duration of the Work.
- B. If, in the opinion of the Engineer, the dust pollution at the site is excessive due to the Contractor's failure to control dust during Work, the work shall be stopped on grounds that the Contractor is not performing work to required quality standards. Any such work stoppage shall be at the Contractor's sole expense.
- C. Water shall be applied as needed for the control of dust to all roads trafficked as part of the Work. The Contractor shall apply water by means of tank trucks equipped with spray bars. Spray controls shall ensure that the water flows evenly and in amounts adequate for the control of dust.
- D. The Engineer may direct that the Contractor apply water at night or early in the morning to reduce evaporation losses.
- E. If necessary, spray exposed soil areas with dust palliative.
- F. Vehicular speeds shall not exceed 20 miles per hour on gravel roads and 10 miles per hour through construction zones in order to control dust and to promote safety within the work area.
- G. Contractor vehicles are prohibited from travel on un-surfaced roads and travel on roads other than those designated by the Drawings for Contractor vehicles. Contractor vehicles are prohibited from off road travel except for vehicles at the working face and construction areas.
- H. Approved cover shall be provided for all exposed bulk materials and/or stockpiles including, but not limited to, sand, gravel, soil, aggregates, or any other potential dust generating material.
- I. Any water obtained for dust control application shall be coordinated with the City Water Utility, metered and paid for by the Contractor, as required by City Ordinance.

3.6 EQUIPMENT WASHING

- A. Equipment washing, including truck washing, shall not result in the discharge of any water to drainage-ways. Truck wash water shall be appropriately disposed of by infiltration or by hauling to an approved discharge facility.
- B. Equipment washing detergent wash water shall be handled in a manner acceptable to the entity having jurisdiction.
- C. Cleaning solvents shall be used only where drips and spills can be captured and properly disposed.
- D. Concrete wash water shall be disposed of in an area where the wash water will not run off before the concrete residue can harden. The concrete residue shall be disposed of in the active landfill on the direction of the Engineer.

END OF SECTION

SECTION 02376 - ROLLED EROSION CONTROL PRODUCTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes: Supply and installation of Rolled Erosion Control Products (RECP).

1.2 DEFINITIONS

- A. Construction Quality Control (CQC): Refers to those activities performed by the Contractor (including those parties responsible for the manufacture, supply, fabrication, delivery, and installation) to demonstrate and/or quantify the characteristics of the product.
- B. Construction Quality Assurance (CQA): Refers to those activities (including but not limited to inspections, verifications, audits, testing and evaluation).
- C. Installer: The Contractor (or a subcontractor to the Contractor) shall act as the installer, i.e., the party responsible for field handling, transporting, storing, deploying, seaming, temporary restraining (against wind), and installation of the Rolled Erosion Control Products. The installer may also be referred to as the Rolled Erosion Control Product subcontractor.
- D. Manufacturer: The party, also referred to as the Rolled Erosion Control Products manufacturer or fabricator, responsible for the production of the Rolled Erosion Control Products in accordance with this Specification.
- E. Rolled Erosion Control Products (RECP): For the purpose of this Specification, RECP includes erosion control matting.

1.3 SUBMITTALS

- A. All submittals shall be made in accordance with Section 01300 – Project Data Submittals.
- B. Prior to shipping material to the site, the Contractor shall submit a sample of all RECP proposed for use on the project.
- C. Prior to shipping material to the site, the Contractor shall submit the following information for all RECP proposed to be used on the project.
 - 1. Manufacturer product specifications.
 - 2. Manufacturer certification that the material is suitable for the design conditions nominated by this Specification.
 - 3. Manufacturer installation recommendations.
 - 4. Contractor proposed construction methods.

- D. Submit 10 working days prior to installation, name of installer, and resume of installation supervisor to be assigned to the project.
- 1.4 QUALITY ASSURANCE AND QUALITY CONTROL
- A. The Contractor shall perform the Work in accordance with Article 12 – General Conditions.
 - B. Contractor shall be responsible for Construction Quality Control (CQC). Contractor shall engage and pay for the services of qualified staff or a qualified subcontractor to perform CQC for monitoring and documenting the quality of the RECP in accordance with the Contract Documents.
 - C. Any Work that does not satisfy the requirements of the Contract Documents, shall be made good in accordance with the requirements of the Contract Documents or as directed by the Engineer at the sole expense of the Contractor.
- 1.5 DELIVERY, STORAGE, AND HANDLING
- A. Wrap rolls in black protective wrap.
 - B. Attach durable label to rolls readable on inside of core and outside of roll wrapping, indicating manufacturer, product name or style number, roll number, and roll dimensions.
 - C. Deliver, store, and handle rolls in manner to prevent damage.
 - D. After unloading, inspect rolls for defects and damage.
 - E. Do not leave covered rolls exposed to elements for more than 30 days unless additional heavy-duty waterproof cover is provided.
 - F. Store rolls off ground, protected from precipitation, ultraviolet radiation, strong chemicals, sparks and flames, temperatures in excess of 160 degrees F and other environmental conditions that could cause damage.

PART 2 - PRODUCT

2.1 EROSION CONTROL MATTING

- A. Erosion control matting shall be a machine-produced mat of wood excelsior or 100 percent agricultural straw.
- B. The wood excelsior matting shall have a minimum dry weight of wood fibers of 0.8 pound per square yard, plus or minus 5 percent. The wood excelsior matting shall be covered on the top and bottom sides with polypropylene netting having maximum mesh spacing of 0.75 inch by 1.75 inches.

- C. Ground anchors for the erosion control matting shall be a minimum of 6 inches in length, and longer if needed.

2.2 ACCESSORIES

- A. Ground Anchoring Devices shall comprise of either:
 - 1. U-shaped wire staples, metal pins, or triangular wooden stakes.
 - 2. Wire staples: Minimum 8 gauge.
 - 3. Metal pins: Steel, minimum 0.20 in. in diameter with one 5-in. steel washer.
 - 4. Wooden stakes: Triangular wooden survey stakes with minimum one 6-in. head.
 - 5. Length: 6 inches or sufficient ground penetration to resist pullout. Longer anchors may be required in looser soils.
- B. Ground Anchoring Devices shall not penetrate within 12 inches of any subsurface features, including but not limited to the geomembrane. Any damage to subsurface features caused by ground anchoring devices shall be repaired at the sole expense of the Contractor.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Grade and compact areas to be covered with erosion control matting (RECP) to the lines and levels as shown on the Drawings. The Surface shall be prepared as per Section 2300 – Earthwork and the following requirements.
- B. Remove rocks, soil clods, and vegetation that could prevent the RECP from being in intimate contact with subgrade. The surface to receive RECP shall be smooth with no ruts or ridges greater than 1 inch.
- C. Excavate 6-inch wide x 12-inch deep anchor trench at upgrade end of installation to inhibit undermining from stray surface water.

3.2 INSTALLATION

- A. RECP shall be installed at the locations shown on the Drawings.
- B. Immediately following establishment of the final grade, RECP shall be unrolled parallel to the flow of water.
- C. Seed and fertilizer shall be placed prior to the placing of the RECP. Seed and fertilizer shall be as follows:
 - 1. Seed shall be 40% boreal red fescue, 40% nortran tufted hairgrass, and 20% glaucous Tundra Blue
 - 2. Fertilizer shall be NPK.

- D. Where more than 1 strip of the RECP is required to cover the given area, it shall overlap the adjacent strip a minimum of 6 inches.
- E. The ends of the RECP shall overlap at least 6 inches with the upgrade section on top.
- F. The RECP shall be secured in accordance with the manufacturers directions and the following:
 - 1. The up-slope end of each RECP shall be staked and buried in a 12-inch-deep trench with the soil firmly tamped against the mat.
 - 2. Three ground anchors per width of matting (1 ground anchor at each overlap) shall be driven below the finish ground line prior to backfilling of the trench.
 - 3. The Engineer may require that any other edge exposed to more than normal flow of water or strong prevailing winds be anchored and buried in a similar manner.
- G. The edges of RECP shall be buried around the edges of catch basins and other structures. RECP must be spread evenly and smoothly and in contact with the soil at all points.
- H. RECP shall be held in place by approved ground anchors driven vertically into the soil. RECP shall be anchored in accordance with the manufacturers' recommendations for channel applications and the following:
 - 1. RECP shall be anchored at intervals not more than 3 feet apart in 3 rows for each strip of the matting, with 1 row along each edge and 1 row alternately spaced in the middle.
 - 2. Anchoring devices and frequency shall be sufficient to securely anchor the RECP flush against the finished grade.
- I. The Contractor shall be responsible to immediately repair all damaged areas. Cost for repair and maintenance shall be included in the unit contract price of the RECP.

END OF SECTION

SECTION 02515 - PRECAST CONCRETE MANHOLE STRUCTURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Precast concrete manhole structures and appurtenant items.
 - 1. Drain manholes and appurtenances.

- B. Referenced Standards: This section incorporates by reference the latest revision of the following documents. It is part of this section as specified and modified. In case of conflict between the requirements of this section and that of the listed documents, the requirements of this section shall prevail.
 - 1. American Association of State Highway and Transportation Officials (AASHTO):
 - a. M198, Standard Specification for Asbestos-Cement Underdrain Pipe.
 - 2. American Society for Testing and Materials (ASTM):
 - a. A48, Standard Specification for Gray Iron Castings.
 - b. A536, Standard Specification for Ductile Iron Castings.
 - c. C150, Standard Specification for Portland Cement.
 - d. C478, Precast Reinforced Concrete Manhole Sections.
 - e. C923, Resilient Connectors Between Reinforced Concrete Manhole Structures and Pipes.
 - f. D1227, Emulsified Asphalt Used As a Protective Coating for Roofing.
 - g. D4022, Standard Specification for Coal Tar Roof Cement, Asbestos Containing.
 - 3. Occupational, Health and Safety Administration (OSHA).

1.2 QUALITY ASSURANCE

- A. Perform QC activities in accordance with Article 12 – General Conditions.

1.3 SUBMITTALS

- A. Shop Drawings:
 - 1. Product technical data including:
 - a. Acknowledgement that products submitted meet requirements of standards referenced.
 - b. Manufacturer's installation instructions.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 - 1. Manhole rings, covers and frames:
 - a. Neenah Foundry.
 - b. Deeter Foundry.

2.2 DRAIN MANHOLE STRUCTURE COMPONENTS

- A. Manhole Components:
 - 1. Reinforcement: ASTM C478.
 - 2. Minimum wall thickness: 5 IN.
 - 3. Minimum base thickness: 12 IN.
 - 4. Provide the following components for each manhole structure:
 - a. Precast barrel section(s).
 - b. Precast adjuster ring(s).
 - 5. Unless dimensioned or specifically noted on Drawings, provide manhole section with minimum 48 IN inside dimensions.
- B. Nonpressure Type Frames and Cover:
 - 1. Cast iron frame and covers: ASTM A48, Class 35 (minimum).
 - 2. Use only cast iron of best quality, free from imperfections and blow holes.
 - 3. Furnish frame and cover of heavy-duty construction a minimum total weight of 450 LBS.
 - 4. Machine all horizontal surfaces.
 - 5. Furnish unit with solid nonventilated lid with concealed pickholes.
 - a. Letter covers "LEACHATE" for all leachate cleanout covers.
- C. Manhole Concrete:
 - 1. Provide all sanitary manholes constructed with Portland ASTM C150, Type I or II cement with a tricalcium aluminate content not to exceed 8 percent.
 - 2. Mix aggregate shall be a minimum of 50 percent crushed limestone.

PART 3 - EXECUTION

3.1 MANHOLE CONSTRUCTION

- A. Build each manhole to dimensions shown on Drawings.
- B. Set and adjust frame and cover to match finished grade elevation.

END OF SECTION

SECTION 02600 - SURFACE WATER DRAINAGE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Stormwater (SW) drainage pipes and culverts as shown on the Drawings and including furnishing, installing, cleaning and testing.
- B. Referenced Standards: This section incorporates by reference the latest revision of the following documents. It is part of this section as specified and modified. In case of conflict between the requirements of this section and that of the listed documents, the requirements of this section shall prevail:
 - 1. American Association of State Highway and Transportation Officials (AASHTO) M294 – Corrugated Polyethylene Pipe, 12 to 36 Inch Diameter.
 - 2. American Society for Testing and Materials (ASTM)
 - a. D2321: Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
 - b. D3261: Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
 - c. F477: Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
 - d. F1055: Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene Pipe and Tubing.

1.2 DEFINITIONS

- A. Construction Quality Control (CQC): Refers to those activities performed by the Contractor (including those parties responsible for the manufacture, supply, fabrication, delivery, and installation) to demonstrate and/or quantify the characteristics of the product.
- B. Construction Quality Assurance (CQA): Refers to those activities (including but not limited to observations, verifications, audits, independent testing, QC data review, and evaluation) performed by the Engineer.
- C. Manufacturer: The party responsible for the production of the materials in accordance with the Specification.
- D. Stormwater (SW): Refers to clean surface water runoff from areas that are hydraulically separate from the active landfill area and do not contain refuse or contain refuse that has been contained by final cover.

1.3 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Materials shall be protected from damage during loading, transporting, unloading and storage.
- B. Do not drop pipe or material.
- C. Keep material clean and dry.
- D. Protect stored materials from damage.
- E. Pipe or other materials shall not be stored on roads or road crossings.

1.4 SUBMITTALS

- A. All submittals shall be made in accordance with Section 01300 – Project Data Submittals.
- B. Prior to shipping materials to the site the Contractor shall submit, manufacturer's product data, certificates of compliance and recommended installation procedures for all proposed materials including pipe, pipe fittings and joints, pipe accessories, valves, and appurtenances.
- C. Manufacturer's certificates of compliance shall demonstrate that the proposed materials meet or exceed the Specifications.
- D. The Contractor shall submit to the Engineer shop drawings for any specially fabricated fittings.
- E. Prior to commencing any Work the Contractor shall submit to the Engineer a detailed work plan describing the proposed work method. The work shall not commence until the Engineer has reviewed and taken no exception to the Work Plan.

1.5 QUALITY ASSURANCE AND QUALITY CONTROL

- A. Contractor shall perform the Work in accordance with Article 12 – General Conditions.
- B. Contractor shall be responsible for Construction Quality Control (CQC). Contractor shall engage and pay for the services of qualified staff or a qualified subcontractor to perform CQC for monitoring and documenting the quality of the surface water drainage pipes and culverts in accordance with the Specifications.
- C. Unless otherwise specified, the Contractor shall complete CQC inspection, sampling, testing or any other action, as considered necessary by the Contractor to ensure that the Work has been completed in accordance with the

Drawings and Specifications. Notwithstanding the results of the Contractor's CQC program, compliance of the Work shall be in conformance with the Drawings and Contract Documents.

- D. Any Work that does not satisfy the requirements of the Drawings and Contract Documents, shall be made good in accordance with the requirements of the Contract Documents or as directed by the Engineer at the sole expense of the Contractor.

PART 2 - PRODUCTS

2.1 CORRUGATED POLYETHYLENE PIPE

- A. All pipe used for surface water drainage shall be smooth interior, double walled, high density polyethylene Corrugated Polyethylene Pipe (CPP).
- B. Corrugated Polyethylene pipe shall meet the requirements of AASHTO M294 Type S.
- C. Acceptance by the Engineer of each manufacturer of corrugated polyethylene culvert pipe shall be contingent on acceptance of an approved joint system.
- D. A manufacturer's Certificate of Compliance shall accompany materials delivered to the site. The certificate shall clearly identify production lots for all materials represented. The Engineer may conduct verification tests of pipe stiffness or other properties.

2.2 JOINTS AND FITTINGS FOR CORRUGATED POLYETHYLENE PIPE

- A. All joints and fittings shall be supplied by the same manufacturer as the pipe.
- B. Only joints and fittings recommended by the pipe manufacturer shall be used.
- C. Joints and fittings shall be manufactured in compliance with ASTM D3261 except as modified here.
 - 1. Electro-fusion fittings shall be manufactured in accordance with ASTM F1055.
 - 2. Specialty fabricated fittings shall be fabricated as indicated on the Drawings and in accordance with the requirements of ASTM D3261.
- D. Joints and fittings shall incorporate internal or external couplers, or coupling bands covering at least 2 full corrugations on each of the pipe ends.
- E. Joints and fittings shall incorporate the use of a gasket conforming to the requirements of ASTM F477. All gaskets shall be installed on the coupling or on the pipe by the manufacturer.

- F. Joints and fittings shall satisfy the testing requirements specified in Section 3.07 of this Specification.

PART 3 - EXECUTION

3.1 PIPE INSTALLATION

- A. All pipe shall be installed to the line and grade shown on the Drawings or as modified by the Engineer. The Engineer may vary the actual line and grade provided that the variation maintains the minimum required grade as indicated on the Drawings. The existing and new CPP culvert piping is identified as “PLS” on the Drawings.
- B. Laying of pipe to line and grade shall be accomplished only after the excavation has been dewatered and the foundation and bedding has been prepared as shown on the Drawings and in accordance with Section 02316 - Trench Excavation and Backfill and Section 02250 – Sheeting, Shoring and Bracing (where required).
- C. Mud, silt, gravel, tools, clothing or any other foreign material shall be kept out of the pipe and off the jointing surfaces at all times. The Engineer may require that before placing the pipe, a canvas bag of suitable size be placed over each end of the pipe and left there until the connection is to be made to the adjacent pipe.
- D. Placed pipe shall be retained in position by mechanical means or otherwise so as to maintain the required alignment and joint closure until sufficient backfill, or alternative method of permanent restraint, has been completed to adequately support the pipe.
- E. All pipe shall be carefully placed piece by piece by means of a derrick, ropes, or other suitable tools or equipment, in such a manner as to prevent damage. Under no circumstances shall materials be dropped or dumped.
- F. Each length of pipe shall be inspected by the Contractor prior to making connections to ensure the pipe is free of foreign objects. Any foreign objects shall be removed by the Contractor prior to connection of the pipe.
- G. Pipe shall be assembled in accordance with the manufacturer's specifications and instructions.
- H. Pipe shall be installed with the minimum soil cover shown on the Drawings.
- I. Cutting of pipe shall be accomplished as recommended by the manufacturer. All cutting, machining, or otherwise shaping the pipe shall be done in a neat, workmanlike manner.

- J. All pipe installation shall conform to ASTM D2321.

3.2 PIPE JOINT AND FITTING INSTALLATION

- A. Pipe joints and fittings shall be assembled in strict accordance with the instructions furnished by the manufacturer.
- B. Pipe handling after the joint or fitting has been affixed shall be carefully controlled to avoid disturbance or exposing it to dirt or other foreign material. Joints and fittings that are disturbed shall be removed and cleaned before the connection is repeated.
- C. Pipe shall be properly aligned before joints and fittings are entirely forced into position. During connection, the pipe shall be partially supported to minimize unequal lateral pressure on the gasket and to maintain concentricity until the gasket is properly positioned.
- D. The gasket and the contact surfaces of the pipe shall be thoroughly lubricated with a lubricant that is approved by both the pipe and gasket manufacturers and will have no harmful effects on the gasket or pipe materials.
- E. Sufficient pressure, as recommended by the manufacturer's installation instructions, shall be applied in making the connection to ensure that it is properly in position. Sufficient restraint shall be applied to the line to ensure that once in position, Joints and Fittings are held in place.
- F. At the completion of work each day the last pipe laid shall be blocked to prevent creep when pipe installation is not in progress.

3.3 REMOVING AND RELAYING CULVERTS

- A. Where shown on the Drawings, or where designated by the Engineer, existing culverts shall be removed and relaid in accordance with these Specifications.
- B. Any culvert that the Drawings do not identify as requiring removal that is damaged by the Contractor's operations shall be replaced at the Contractor's sole expense.
- C. All culvert sections removed and not relaid shall become the property of the Contractor.

3.4 INSPECTION

- A. All new pipes and culverts shall be inspected after installation and during connection of pipe joints and fittings. In general, such inspections shall be visual observation of the work being performed.

- B. Inspections shall be conducted in the presence of the Engineer.
- C. No pipe or structure shall be enclosed or covered until it has been observed by the Engineer.

END OF SECTION

SECTION 02614 - HDPE PIPE AND FITTINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: High Density Polyethylene (HDPE) pipe and fittings for Leachate Collection System.

- B. Referenced Standards: This section incorporates by reference the latest revision of the following documents. It is part of this section as specified and modified. In case of conflict between the requirements of this section and that of the listed documents, the requirements of this section shall prevail.
 - 1. American Society for Testing and Materials (ASTM):
 - a. D638: Standard Test Method for Tensile Properties of Plastics.
 - b. D695: Standard Test Method for Compressive Properties of Rigid Plastics.
 - c. D1248: Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable.
 - d. D2837: Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products.
 - e. D3261: Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
 - f. D3350: Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.
 - g. F714: Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter.
 - h. F1055: Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene Pipe and Tubing.

1.2 DEFINITIONS

- A. Construction Quality Control (CQC): Refers to those activities performed by the Contractor (including those parties responsible for the manufacture, supply, fabrication, delivery, and installation) to demonstrate and / or quantify the characteristics of the product.

- B. Construction Quality Assurance (CQA): Refers to those activities (including but not limited to observations, verifications, audits, independent testing, QC data review, and evaluation) performed by the Engineer.

- C. Installer: The party responsible for transporting, storing, handling, deploying, installing, and protecting the HDPE pipe and fittings.

- D. Manufacturer: The party responsible for the production of the HDPE pipe and fittings in accordance with this Specification.
- 1.3 SUBMITTALS
- A. Submit under provisions of Section 01300 – Project Data Submittals.
 - B. Prior to shipping any material to the site, submit the following:
 - 1. Manufacturer's product data including pipe, pipe accessories, and appurtenances. Provide manufacturers certificates for materials that meet or exceed these Specifications.
 - C. Prior to installation of any components, submit the following:
 - 1. Pipe installer's qualifications.
 - 2. Plan(s) showing pipe installation sequence and schedule.
- 1.4 QUALITY ASSURANCE AND QUALITY CONTROL
- A. Perform QC activities in accordance with Article 12 – General Conditions.
 - B. The Contractor shall engage and pay for the services of qualified staff or a qualified subcontractor to perform CQC activities. Subcontracted organizations shall be commercial entities normally engaged in QA/QC services for waste disposal facilities. Individuals, whether on the Contractor's or subcontractor's staff, shall have a minimum of 1 year of directly applicable experience pertinent to the requirements of this section.
 - C. The results of each day's CQC testing and inspection shall be submitted to the Engineer before the start of installation on the next working day.
- 1.5 PRODUCT DELIVERY STORAGE AND HANDLING
- A. Labeling: The following information shall be continuously marked on the pipe and spaced at intervals not to exceed 5 feet:
 - 1. Name and/or trademark of the pipe manufacturer
 - 2. Nominal pipe size
 - 3. Standard Dimensional Ratio (SDR)/Schedule
 - 4. Material Classification
 - 5. Manufacturing Standard Reference
 - 6. A production code from which the date and place of manufacture can be determined
 - B. Transportation is the responsibility of the Contractor, who shall be liable for all damages prior to and during transportation to site.
 - C. During shipment and storage, the pipe shall be wrapped in relatively impermeable and opaque protective covers.

- D. Inspect materials delivered to the site for damage. Unload and store with minimum of handling. Store materials on-site in enclosures or under protective coverings. Store pipe and fittings in a flat, horizontal position, and under cover, out of direct sunlight. Do not sort materials directly on the ground. Keep inside of piping free of dirt and debris.
- E. Handling, storage, and care on-site are the responsibility of the Contractor prior to, during and after installation. Handle pipes, fittings, and other accessories in a manner that ensures delivery to the point of installation in sound, undamaged condition. Do not drop pipe. Carry, do not drag, pipe to the point of installation.

1.6 QUALIFICATIONS

- A. The pipe installer shall be qualified by experience in installation of HDPE pipe.
- B. Contractors are considered qualified by installing a minimum combined total of 15,000 feet of HDPE pipe using thermal fusion joining on at least 3 separate projects.
- C. Joining pipe by butt-fusion welding shall be conducted according to manufacturer’s recommendation by a person/persons certified as capable of conducting butt-fusion techniques by the pipe manufacturer or manufacturer’s authorized representative.

PART 2 - PRODUCTS

2.1 HDPE MATERIAL

- A. HDPE pipe and fittings shall be extruded from an extra-high molecular weight, high-density polyethylene compound conforming to ASTM D3350 for a PE 4710 material with a cell classification as shown in the Pipe Schedule (Table 1), or better. This material shall have a minimum long-term hydrostatic strength of 1600 psi when tested and analyzed by ASTM D2837.

TABLE 1			
SYSTEM	NOMINAL DIAMETER	SDR	ASTM D3350 CELL CLASSIFICATION
Leachate, Force Main and Cleanout Conveyance Pipes; Storm Drain Force Mains (SD-1 and SD-2)	3” and 4”	17	445474 or higher
Side Slope Riser and Sump Collector	16” and 24”	17	445474 or higher

- B. The polyethylene compound shall be suitably protected against degradation by ultraviolet light by means of carbon black, well dispersed by precompounding in a concentration of not less than 2 percent.
- C. The manufacturer shall be listed with the Plastic Pipe Institute as meeting the recipe and mixing requirements of the resin manufacturer for the resin used to manufacture the pipe and fittings for this project.
- D. HDPE products shall contain no recycled compounds except that generated in the manufacturer's own plant from resin of the same specifications from the same raw material supplier.

2.2 HIGH DENSITY POLYETHYLENE (HDPE) PIPE

- A. HDPE pipe meeting the requirements of this section shall be used for all leachate collection and conveyance system piping, the leachate seep collection system, and all other piping unless specified or otherwise shown on the Drawings.
- B. The same manufacturer shall supply polyethylene pipe and fittings. Pipe and fittings from different manufacturers shall not be interchanged.
- C. Pipe and fittings shall be of the nominal diameter shown on the Drawings. All pipe sizes, either solid or perforated, shall conform to ASTM F714.
- D. The maximum allowable hoop stress shall be 1000 psi at 140 degrees F.
- E. The polyethylene pipe shall be homogenous throughout and free of visible cracks, holes, foreign inclusions, or other injurious defects. Any pipe with nicks, scrapes, or gouges deeper than 5 percent of the nominal wall thickness shall be rejected. The pipe shall be uniform in color, opacity, density, and other physical properties.
- F. Perforated pipe shall have slots 0.2 inch wide and 2 inches long, in four places equidistant around the pipe. Slots shall provide at least 8 square inches of open area per linear foot of pipe. Slotted pipe shall be free of cutting debris from the slot cutting process.
- G. Joints and pipe connections shall be thermal butt-fusion. No mechanical couplings shall be used unless shown on the Drawings or approved by the Engineer.

2.3 HIGH DENSITY POLYETHYLENE (HDPE) FITTINGS

- A. HDPE fittings shall be from the same manufacturer as the pipe, molded or fabricated from HDPE pipe and shall have the same or numerically smaller SDR than pipe connecting to the fitting. HDPE fittings shall be molded, for sizes 8-inch and smaller, if manufactured as a standard item. All other HDPE

fittings shall be fabricated from HDPE pipe by means of thermal butt-fusion unless otherwise noted.

- B. All reducing tees shall be factory-molded if available as a standard item by any manufacturer having pipe, meeting this section. If not available as a standard item, branch saddle reducing tees shall be used. Reducers shall be shop-manufactured. Field fabricated branch saddle connections will not be allowed.
- C. All molded HDPE fittings shall have the same or higher pressure rating as the pipe when installed in accordance with the latest technical specifications. All fabricated HDPE fittings shall have the same or higher pressure rating as the adjoining pipe when installed in accordance with the manufacturer's recommendations.

2.4 PIPE CONNECTIONS

- A. Joints and pipe connections shall be thermal butt-fusion. No mechanical couplings shall be used except where shown on the Drawings or approved by the Engineer.

2.5 TEMPORARY CONNECTIONS

- A. Couplers used for temporary piping connections shall be mechanical type with adjustable bolts and teeth to grip the HDPE pipe. Fasteners shall be 316 stainless steel and the coupler body shall be galvanized or painted. Couplers shall be Style 995 HDP as manufactured by Victaulic, or approved equal.

2.6 FLANGES

- A. Flange backup rings shall be 316 stainless steel with 150-pound, ANSI B16.5 standard dimensions unless specified otherwise. Flanges shall be complete with one-piece, polyethylene molded flange adapter. Flanged connections shall have the same or greater pressure rating as the pipe. All fasteners shall be 316 stainless steel and shall be assembled with anti-seize compound as recommended by the manufacturer. Gaskets shall be installed at all flanged connections.

2.7 FLANGED COUPLING ADAPTER

- A. Flanged coupling adapters shall be Romac Industries Series FCA501 or equal. Gaskets shall be manufactured from Buna N. All ductile parts shall be coated with fusion bonded epoxy in accordance with AWWA. Flanged coupling adapters shall meet the requirements of AWWA C219. All nuts and bolts shall be stainless steel.

2.8 GASKETS

- A. Gaskets shall be flat ring, 1/8th-inch Viton. Gaskets are not required for HDPE to HDPE flanged connections.

2.9 HARDWARE

- A. Bolts, nuts, washers, and miscellaneous hardware shall be 316 stainless steel unless noted otherwise on the Drawings or in these Specifications. All hardware shall be assembled with anti-seize compound as recommended by the manufacturer.

2.10 ELECTROFUSION COUPLING

- A. Electrofusion couplings shall be used where shown on the Drawings, in situations where welding machine access is difficult or impossible, or as determined by the Engineer.
- B. Electrofusion couplings shall be a rigid straight coupler constructed from injection-molded polyethylene with embedded heating coils. Electrofusion couplings shall be manufactured in accordance with ASTM F1055. Electrofusion couplers shall be Frialen Straight Couplers, as manufactured by Friatec, or equivalent.

PART 3 - EXECUTION

3.1 GENERAL

- A. Install HDPE Pipe and Fittings at the locations, lines and grades shown on the Drawings. All HDPE Pipes and Fittings shall be installed in accordance with these Specifications.
- B. Materials and Work which fail to meet the requirements of these Specifications shall be removed and disposed of at the Contractor's expense.

3.2 PLACEMENT AND HANDLING

- A. Handle all materials in such a manner as to ensure it is not damaged in any way.
- B. During shipment and storage, the pipe shall be wrapped in relatively impermeable and opaque protective covers.
- C. Pipe shall be marked with the manufacturer's name, product identification, and lot number.
- D. The Engineer will examine the piping over the entire surface to ensure that no potentially harmful foreign objects are present. Any foreign objects so encountered shall be removed by the Contractor, or material shall be replaced.

3.3 CONFORMANCE TESTING

- A. Samples of materials delivered to site may be collected for testing to verify conformance with properties in Part 2 of this Specification, at Engineer's discretion.
- B. Samples, if required, will be obtained by the Engineer. All testing performed will be paid for by the Contractor.

3.4 PIPE JOINING

- A. HDPE pipe shall be cut, fabricated and installed in strict conformance with the pipe manufacturer's recommendations.
- B. HDPE pipe lengths, fittings, and flanged connections shall be joined by thermal butt fusion and be of the same type, grade, and class of polyethylene compound and supplied from the same raw material supplier. Butt fusion of pipes and fittings shall be performed in accordance with ASTM D3261 and the pipe manufacturer's recommendations.
- C. Butt-fusion shall be done with equipment recommended by the pipe manufacturer. Butt-fusion equipment shall meet the pipe manufacturer's recommended fusion temperature, pressure, and alignment.
- D. Butt-fusion joining shall be 100 percent efficient offering a joint weld strength equal to, or greater than the tensile strength of the pipe. Solid HDPE pipe shall have airtight joints.
- E. One sample joint shall be taken for each size pipe on all days that butt-fusion is performed. The trial butt-fusion joint shall have a test strap removed for testing. The test strap shall be 6" or 15 pipe wall thickness long on each side of the fusion and about 1" or 1-1/2 wall thickness wide. The strap will be bent until the ends of the strap touch. Any disbondment at the fusion is unacceptable. If failure occurs, the procedures or machine set up shall be changed and a new trial fusion and bent strap test specimen will be prepared and tested.
- F. Data will be logged for each joint, including time, location, and temperature. This information shall be furnished to the Engineer.

3.5 MECHANICAL CONNECTIONS

- A. Mechanical connections of the polyethylene pipe to auxiliary equipment, such as valves and other piping systems, shall be through flanged connections that shall consist of the following:
 - 1. A polyethylene molded flange adapter (MFA) shall be thermally butt-fused to the ends of the pipe.

2. Backup rings, as specified in Section 2.6, shall be used behind the MFA.
 3. Fasteners shall be of sufficient length to show a minimum of three complete threads when the joint is made and tightened to the manufacturer's standard. The Contractor shall retorque the nuts after 4 hours.
- B. Assembly: Prior to connecting flanged pipe, the faces of the flanges shall be thoroughly cleaned of all oil, grease, and foreign material. The gaskets shall be thoroughly cleaned and checked for proper fit. Care shall be taken to ensure proper seating of the flange gasket. All bolted connections shall be tightened with a torque wrench and bolts shall be tightened to the torque specified by the manufacturer of the HDPE flanges and/or backing rings and/or gaskets. Follow the manufacturer's specified bolt-tightening sequence. Bolts may be pre-tightened using conventional wrenches and/or air tools as long as the pre-tightening torque does not exceed approximately 50 percent of the final torque and the bolt-tightening sequence is followed. Do not attempt to flange up a pipeline that is too short by drawing the bolts together. If joints leak when the air pressure test is applied, the gaskets shall be removed and reset and bolts re-tightened.

3.6 ELECTROFUSION COUPLINGS

- A. Electrofusion couplings shall be installed in strict conformance with manufacturer's instructions. All required equipment, manufacturer-recommended regulator and generator shall be provided by the Contractor. Workmen shall be trained in the installation, and the welding procedure shall be reviewed with the Engineer prior to start of work.

3.7 ALLOWANCE FOR THERMAL EXPANSION/CONTRACTION

- A. HDPE has a coefficient of thermal expansion of 1.2×10^{-4} ft/ft/deg F. Above ground HDPE pipe shall be installed with excess length between anchor points such that contraction caused by temperature drop to 0 degrees F will produce the length of pipe between two points shown on the Drawings. Buried HDPE pipe shall be installed with excess length between anchor points such that contraction caused by temperature drop to 40 degrees F will produce the length of pipe between two points shown on the Drawings. Amount of excess pipe depends on temperatures of pipe at the time of installation, according to Table 2 for above ground and buried piping:

TABLE 2	
INSTALLATION TEMPERATURE (DEGREES F)	EXCESS PIPE LENGTH (IN./100 FT)
Aboveground Piping:	
30	4.3
40	5.8
50	7.2
60	8.6
70	10.1
80	11.5
90	13.0
100	14.4
120	17.3
Buried Piping:	
50	1.4
60	2.9
70	4.3
80	5.8
90	7.2
100	8.6
120	11.5

3.8 CLEANING

- A. Piping systems shall be cleaned and tested in accordance with the manufacturer’s recommendation and as specified herein.
- B. Prior to testing, pipelines shall be cleaned to remove shavings, welding slag, dirt, construction debris, and other foreign material and flushed with clean water at a minimum of 3 fps velocity.

3.9 PIPE LEAK TEST

- A. Conduct pressure and leakage tests on newly installed pipelines and appurtenances (except perforated piping systems), in accordance with a testing plan approved by the Engineer. The testing plan shall be developed in accordance with the minimum requirements included in this section. The Contractor shall furnish all necessary equipment and material and make taps in piping, as necessary, for testing as specified.
- B. Conduct testing of all piping according to the following requirements:
 - 1. Conduct pressure and leakage tests on newly installed pipelines and appurtenances, in accordance with the reviewed testing plan.

2. Furnish necessary equipment and material and make taps in piping, as necessary, for testing and as specified.
 3. Engineer will observe the tests.
 4. Provide two (2) days advance written notice of start of testing to Engineer.
 5. Final test pressures and the type of test shall be hydrostatic at 50 psi, unless otherwise specified. Refer to Section 15050, subsection 3.6 for details.
 6. Separately test pressure pipe sections that can be isolated by valves.
 7. Make records of each piping system during the test to document the following:
 - a. Date of test.
 - b. Description and identification of piping tested.
 - c. Test pressure.
 - d. Remarks, including:
 - 1) Leaks (type, location)
 - 2) Repairs made on leaks
 - e. Certification by Contractor and signed acknowledgement by Engineer that tests have been satisfactorily completed.
 8. Conduct testing of piping to be buried as follows:
 - a. Initial Service Leak Test: Conduct pneumatic tests at 10 psig with partially backfilled trench and joints left open for inspection, as field conditions permit and as approved by the Engineer.
 - b. Final Acceptance Test: Conduct after trench has been completely backfilled, see paragraph 5 above.
 - c. Expose all joints on buried piping to be pneumatically tested during the initial service leak test.
 9. Conduct final testing of exposed piping after piping has been completely installed and inspected for proper installation including all supports and anchors.
- C. The general types of equipment required for pneumatic leak testing include the following:
1. Pneumatic compressor separator-dryer system capable of providing oil-free dry air and equipped with one or more full capacity safety relief valves set at a pressure of not more than 105 percent of the required primary test pressure.
 2. Calibrated test gauge.
 3. Other miscellaneous equipment necessary to conduct the leak test.
- D. The procedures for conducting the initial test are as follows:
1. Perform pneumatic testing using accurately calibrated instruments and oil-free dry air.
 2. Perform initial service leak tests only on exposed piping. Perform initial leak testing by gradually bringing the piping system up to

- normal operating pressure and hold continuously for a minimum of 10 minutes. Examine joints and connections for leakage with soap bubbles. The piping system, exclusive of possible localized instances at pump or valve packing, shall show no visual evidence of leaking. Correct any visible leakage and retest as directed by the Engineer.
3. Test all parts of the piping system at the test pressure specified.
 4. Take all necessary precautions to protect test personnel and Owner's operating personnel from hazards associated with air testing.
 5. Secure piping to be tested to prevent damage to adjacent piping and equipment in event of a joint failure.
 6. Prior to test, remove or suitably isolate appurtenant instruments or devices that could be damaged by test.
 7. Apply soap bubbles to joints and connections for examining leakage.
 8. Apply maximum 10-psig preliminary pneumatic test to piping system prior to final leak testing, to locate visible leaks. Bleed pressure completely prior to conducting final leak testing.
 9. Correct visible leaks, and repeat the preliminary test until all visible leaks are corrected.
 10. Gradually increase pressure in the system to not more than 1/2 of specified test pressure.
 11. Thereafter, increase pressure in steps of approximately 1/10 of specified test pressure until required test pressure is reached.
 12. Maintain pneumatic test pressure continuously for minimum 10 minutes and for such additional time as necessary to conduct soap bubble examination for leakage.
 13. Correct visible leakage and retest as required by the Engineer.
 14. The piping system, exclusive of possible localized instances at pump or valve packing, shall show no visual evidence of leakage.
- E. Pipe and joints being tested shall be considered acceptable when hydrostatically tested at an average pressure of 50 pounds per square inch. Provide calculations for maximum acceptable loss before testing and field data sheets with test results for Engineer approval.
- F. All perforated pipe joints shall be butt-fused with the same care and workmanship as pressure-tested pipelines. Pipe joints at every 200 feet (10 joints) shall be tested as defined in Part 3.4.E and F of this Specification.

END OF SECTION

SECTION 02810 - FENCING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Chain-link fencing
 - 2. Gates

- B. Related Sections:
 - 1. Section 03002 – Concrete

1.2 RELATED DOCUMENTS

- A. Drawings C-210 and C-211
- B. Project Specifications

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance:
 - 1. Wind Loads: 120 mph
 - 2. Fence Height: 6 feet
 - 3. Minimum Post Size: line – 3”, and Corner/Pull – 4”
 - 4. Maximum Post Spacing: 8 feet
 - 5. Post Material: Sch. 40 steel

1.4 SUBMITTALS

- A. All submittals shall be in accordance with Section 01300 – Project Data Submittals.
- B. Provide detailed shop drawings for:
 - 1. Fence and gate posts, rails, and fittings
 - 2. Chain-link fabric, reinforcements, and attachments
 - 3. Gates and hardware
- C. Provide calculations by a qualified designer that demonstrates the fencing and gates meet the 120 mph wind load requirement.
- D. Warranty for work.

1.5 WARRANTY

- A. Fence installer shall warranty the installed fence system for a period of five (5) years from date of Owner’s beneficial occupancy.

PART 2 - PRODUCTS

2.1 CHAIN-LINK FENCE FABRIC

- A. General: Provide fabric in one piece heights.
 - 1. Fabric height as shown on Drawings
 - 2. Steel Wire Fabric:
 - a. 9 gauge, 2-inch mesh
 - b. Hot-dipped galvanized

2.2 FENCE FRAMING

- A. General: Refer to Drawings for details of min. post and rail diameters, spacing, and dimensions.

2.3 TENSION WIRE AND FITTINGS

- A. General: Refer to Drawings for details of tension wires, braces, clips, ground wire, and other accessories and fittings.

2.4 DOUBLE-SWING GATE

- A. General: Refer to Drawings for details of the double-swing gate that the Contractor will refurbish or replace as part of the work.

2.5 ANCHORING CEMENT

- A. Refer to Specification 03002 – Concrete.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Stake locations of fencing, gates, and terminal posts. Review layout with Engineer prior to installation of fencing.

3.2 INSTALLATION – GENERAL

- A. Install fencing to comply with ASTM F 567, the approved shop drawings, and the Contract Drawings.
- B. Installation shall be straight and true, and installed to industry standards.

END OF SECTION

SECTION 03002 – CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Cast-in-place concrete and grout.

- B. Referenced Standards: This section incorporates by reference the latest revision of the following documents. It is part of this section as specified and modified. In case of conflict between the requirements of this section and that of the listed documents, the requirements of this section shall prevail:
 - 1. American Concrete Institute (ACI):
 - a. 116R: Cement and Concrete Terminology.
 - b. 211.1: Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete.
 - c. 212.3R: Chemical Admixtures for Concrete.
 - d. 304R: Guide for Measuring, Mixing, Transporting, and Placing Concrete.
 - e. 304.2R: Placing Concrete by Pumping Methods.
 - f. 306R: Cold Weather Concreting.
 - g. 347R: Recommended Practice for Concrete Formwork.
 - 2. ASTM International (ASTM):
 - a. A82: Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
 - b. A185: Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
 - c. A615: Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
 - d. A775: Standard Specification for Epoxy-Coated Steel Reinforcing Bars.
 - e. C31: Standard Practice for Making and Curing Concrete Test Specimens in the Field.
 - f. C33: Standard Specification for Concrete Aggregates.
 - g. C39: Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
 - h. C94: Standard Specification for Ready-Mixed Concrete.
 - i. C138: Standard Method of Test for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete.
 - j. C143: Standard Test Method for Slump of Hydraulic Cement Concrete.
 - k. C150: Standard Specification for Portland Cement.
 - l. C157: Standard Test Method for Length Change of Hardened Hydraulic-Cement, Mortar, and Concrete.
 - m. C172: Standard Practice for Sampling Freshly Mixed Concrete.

- n. C173: Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
- o. C231: Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
- p. C260: Standard Specification for Air-Entraining Admixtures for Concrete.
- q. C289: Standard Test Method for Potential Alkali-Silica Reactivity of Aggregates (Chemical Method).
- r. C309: Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
- s. C494: Standard Specification for Chemical Admixtures for Concrete.
- t. C618: Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
- u. E329: Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction.

1.2 QUALITY ASSURANCE

- A. Quality Control:
 - 1. Do not begin concrete production until proposed concrete mix design has been approved by Engineer.
 - a. Approval of concrete mix design by Engineer does not relieve Contractor of his responsibility to provide concrete that meets the requirements of this Specification.
 - 2. Adjust concrete mix designs when material characteristics, job conditions, weather, strength test results or other circumstances warrant.
 - a. Do not use revised concrete mixes until submitted to and approved by Engineer.
- B. Qualifications:
 - 1. Ready mixed concrete batch plant certified by National Ready Mixed Concrete Association (NRMCA).

1.3 DEFINITIONS

- A. Per ACI 116R except as modified herein:
 - 1. Concrete fill: Non-structural concrete.
 - 2. Concrete Testing Agency: Testing agency employed to perform materials evaluation, design of concrete mixes or testing of concrete placed during construction.
 - 3. Exposed concrete: Exposed to view after construction is complete.
 - 4. Indicated: Indicated by Contract Documents.
 - 5. Lean concrete: Concrete with low cement content.

6. Nonexposed concrete: Not exposed to view after construction is complete.
7. Required: Required by Contract Documents.
8. Specified strength: Specified compressive strength at 28 days.
9. Submitted: Submitted to Engineer.

1.4 SUBMITTALS

A. Shop Drawings:

1. See Section 01300, Project Data Submittals for requirements of the mechanics and administration of the submittal process.
2. Concrete mix designs proposed for use.
 - a. Concrete mix design submittal to include the following information:
 - 1) Sieve analysis and source of fine and coarse aggregates.
 - 2) 28-day cylinder compressive test results of trial mixes per ACI 318 and as indicated herein.
3. Product technical data including:
 - a. Acknowledgement that products submitted meet requirements of standards referenced.
4. Strength test results of in place concrete including slump, air content and concrete temperature performed by Engineer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Storage of Material:

1. Cement and fly ash:
 - a. Store in moistureproof, weathertight enclosures.
 - b. Do not use if caked or lumpy.
2. Aggregate:
 - a. Store to prevent segregation and contamination with other sizes or foreign materials.
 - b. Do not use frozen or partially frozen aggregates.
 - c. Do not use bottom 6 IN of stockpiles in contact with ground.
 - d. Allow sand to drain until moisture content is uniform prior to use.
3. Admixtures:
 - a. Protect from contamination, evaporation, freezing, or damage.
 - b. Maintain within temperature range recommended by manufacturer.
 - c. Completely mix solutions and suspensions prior to use.
4. Reinforcing steel: Support and store all rebars above ground.

B. Delivery:

1. Concrete:
 - a. Prepare a delivery ticket for each load for ready-mixed concrete.

2. Reinforcing steel:
 - a. Ship to jobsite with attached plastic or metal tags to identify project.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Portland Cement: Conform to ASTM C150 Type II.
- B. Fly Ash:
 1. ASTM C618, Class F or Class C.
 2. Nonstaining.
 - a. Hardened concrete containing fly ash to be uniform light gray color.
 3. Maximum loss on ignition: 4 percent.
 4. Compatible with other concrete ingredients.
- C. Admixtures:
 1. Air entraining admixtures: ASTM C260.
 2. Water reducing, retarding, and accelerating admixtures:
 - a. ASTM C494 Type A through E.
 - b. Conform to provisions of ACI 212.3R.
 - c. Do not use retarding or accelerating admixtures unless specifically approved in writing by Engineer and at no cost to Owner.
 - d. Follow manufacturer's instructions.
 - e. Use chloride free admixtures only.
 3. Do not use calcium chloride.
 4. Pozzolanic admixtures: ASTM C618.
 5. Provide admixtures of same type, manufacturer and quantity as used in establishing required concrete proportions in the mix design.
- D. Water: Potable, clean, free of oils, acids and organic matter.
- E. Aggregates:
 1. Normal weight concrete: ASTM C33, except as modified below.
 2. Fine aggregate:
 - a. Clean natural sand.
 - b. No manufactured or artificial sand.
 3. Coarse aggregate:
 - a. Crushed rock, natural gravel, or other inert granular material.
 - b. Maximum amount of clay or shale particles: 1 percent.
 4. Gradation of coarse aggregate:
 - a. Lean concrete and concrete topping: Size #7.
 - b. All other concrete: Size #57 or #67.
- F. Reinforcing Steel:

1. Reinforcing bars: ASTM A615, Grade 60.
2. Welded wire fabric: ASTM A185.
 - a. Minimum yield strength: 60,000 psi.

- G. Forms:
1. Prefabricated or job built.

2.2 CONCRETE MIXES

- A. General:
1. All concrete to be ready mixed concrete conforming to ASTM C94.
 2. Provide concrete of specified quality capable of being placed without segregation and, when cured, of developing all properties required.
 3. All concrete to be normal weight concrete.

- B. Strength:
1. Provide specified strength and type of concrete for each use in structure(s) as follows:

TYPE	WEIGHT	SPECIFIED STRENGTH*
Concrete fill	Normal weight	4000 psi

*Minimum 28-day compressive strength.

- C. Air Entrainment:
1. Provide air entrainment in all concrete resulting in a total air content percent by volume as follows:

MAX AGGREGATE SIZE	TOTAL AIR CONTENT PERCENT
1 IN or 3/4 IN	5 to 7
1/2 IN	5 1/2 to 8

2. Air content to be measured in accordance with ASTM C231, ASTM C173, or ASTM C138.

- D. Slump - 4 IN maximum, 1 IN minimum:
1. Measured at point of discharge of the concrete into the concrete construction member.
 2. Concrete of lower than minimum slump may be used provided it can be properly placed and consolidated.
 3. Pumped concrete:
 - a. Provide additional water at batch plant to allow for slump loss due to pumping.
 - b. Provide only enough additional water so that slump of concrete at discharge end of pump hose does not exceed maximum slump specified above.

4. Determine slump per ASTM C143.
- E. Selection of Proportions:
1. General:
 - a. Proportion ingredients to:
 - 1) Produce proper workability, durability, strength, and other required properties.
 - 2) Prevent segregation and collection of excessive free water on surface.
 2. Minimum cement contents and maximum water cement ratios for concrete to be as follows:

SPECIFIED STRENGTH	MINIMUM CEMENT, LB/CY MAXIMUM AGGREGATE SIZE			MAXIMUM WATER CEMENT RATIO BY WEIGHT
	1/2 IN	3/4 IN	1 IN	
4000	---	517	517	0.45

3. Substitution of fly ash: Maximum of 25 percent by weight of cement at rate of 1 LB fly ash for 1 LB of cement.
4. Normal weight concrete:
 - a. Proportion mixture to provide desired characteristics using one of methods described below:
 - 1) Method 1 (Trial Mix): Per ACI 318, Chapter 5, except as modified herein.
 - a) Air content within range specified above.
 - b) Record and report temperature of trial mixes.
 - c) Proportion trial mixes per ACI 211.1.
 - 2) Method 2 (Field Experience): Per ACI 318, Chapter 5, except as modified herein:
 - a) Field test records must be acceptable to Engineer to use this method.
5. Required average strength to exceed the specified 28-day compressive strength by the amount determined or calculated in accordance with the requirements of Paragraph 5.3 of ACI 318 using the standard deviation of the proposed concrete production facility as described in Paragraph 5.3.1 of ACI 318.

PART 3 - EXECUTION

3.1 FORMING AND PLACING CONCRETE

A. Formwork:

1. Contractor is responsible for design and erection of formwork.
2. Construct formwork so that concrete members and structures are of correct size, shape, alignment, elevation and position.
 - a. Allowable tolerances: As recommended in ACI 347R.
3. Openings: Provide openings in formwork to accurately place and securely support items built into forms.
4. Coat form surfaces with form release agents prior to placing reinforcing bars in forms.

B. Reinforcement:

1. Position, support and secure reinforcement against displacement.
2. Locate and support with chairs, runners, bolsters, spacers and hangers, as required.
3. Set wire ties so ends do not touch forms and are directed into concrete, not toward exposed concrete surfaces.
4. Lap splice lengths: ACI 318 Class B top bar tension splices unless indicated otherwise on the Drawings.
5. Extend reinforcement to within 2 IN of concrete perimeter edges.
 - a. If perimeter edge is earth formed, extend reinforcement to within 3 IN of the edge.
6. Minimum concrete protective covering for reinforcement: 2".
7. Do not weld reinforcing bars.
8. Welded wire fabric:
 - a. Install welded wire fabric in maximum practical sizes.
 - b. Splice sides and ends with a splice lap length measured between outermost cross wires of each fabric sheet not less than:
 - 1) One spacing of cross wires plus 2 IN.
 - 2) 1.5 x development length.
 - 3) 6 IN.
 - c. Development length: ACI 318 basic development length for the specified fabric yield strength.

C. Embedments:

1. Set and build in anchorage devices and other embedded items required for other work that is attached to, or supported by concrete.

D. Placing Concrete:

1. Place concrete in compliance with ACI 304R and ACI 304.2R.
2. Place in a continuous operation within planned joints or sections.
3. Place concrete by methods which prevent aggregate segregation.

4. Do not allow concrete to free fall more than 4 FT.
- E. Consolidation: Consolidate all concrete using mechanical vibrators supplemented with hand rodding and tamping, so that concrete is worked around reinforcement and embedded items into all parts of forms.
- F. Protection:
 1. Protect concrete from physical damage or reduced strength due to weather extremes.
 2. In cold weather comply with ACI 306R except as modified herein.
 - a. Do not place concrete on frozen ground or in contact with forms or reinforcing bars coated with frost, ice or snow.
 - b. Minimum concrete temperature at the time of mixing:

OUTDOOR TEMPERATURE AT PLACEMENT (IN SHADE)	CONCRETE TEMPERATURE AT MIXING
Below 30 DegF	70 DegF
Between 30-45 DegF	60 DegF
Above 45 DegF	50 DegF

- G. Curing:
 1. Provide protection as required to prevent damage to concrete and to prevent moisture loss from concrete during curing period.
 2. Provide curing for minimum of 7 days.
- H. Form Removal:
 1. Remove forms after concrete has hardened sufficiently to resist damage from removal operations or lack of support.
 2. Where no reshoring is planned, leave forms and shoring used to support concrete until it has reached its specified 28-day compressive strength.

3.2 CONCRETE FINISHES

- A. Tolerances:
 1. 1/4 IN in 10 FT.
- B. Surfaces Exposed to View:
 1. Remove fins and projections, and patch voids, air pockets, and honeycomb areas with cement grout.
- C. Surfaces Not Exposed to View:
 1. Patch voids, air pockets and honeycomb areas with cement grout.

3.3 GROUT

- A. Preparation:
 - 1. Nonshrinking nonmetallic grout:
 - a. Clean concrete surface to receive grout.
 - b. Saturate concrete with water for 2 HRS prior to grouting.
- B. Application:
 - 1. Nonshrinking nonmetallic grout:
 - a. Mix in a mechanical mixer.
 - b. Use no more water than necessary to produce flowable grout.
 - c. Place in accordance with manufacturer's instructions.
 - d. Completely fill all spaces and cavities.

3.4 FIELD QUALITY CONTROL

- A. Contractor to provide Engineer with certification that the concrete mix design was prepared in compliance with Section 2.2 – Concrete Mixes.
- B. Acceptance of Concrete:
 - 1. Visual inspection of finished concrete and review of the certification (3.4.A) by the Engineer.

END OF SECTION

SECTION 11220 – SIDE SLOPE PUMPS

PART 1 - GENERAL

1.1 SUMMARY

This Section specifies side slope pumps for leachate, complete with accessories and appurtenances.

1.2 RELATED WORK

A. The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractor's responsibility to perform all the work required by the Contract Documents.

1. Section 02614 HDPE Pipe and Fittings
2. Section 15010 Mechanical General Provisions
3. Section 15050 Piping Systems
4. Section 15068 Stainless Steel Pipe and Fittings
5. Section 15080 Valves
6. Division 16 Electrical
7. Section 16150 Motors
8. Division 17 Controls

1.3 SUBMITTALS

A. In accordance with the requirement of Section 01300, submit the following Project Data:

1. Descriptive literature, bulletins, and catalog cuts of the equipment.
2. Performance curves
3. Materials of construction
4. Complete wiring diagrams
5. Complete installation instructions, with points of electrical and plumbing connection requirements clearly shown.
6. Warranty information

B. Cable Lengths:

1. The Contractor shall submit the cable lengths for both power and control cable required to connect each of the pumps to the appropriate equipment.
2. Splices shall be pre-approved by the Engineer. Approved splices, if any, will be installed with the corresponding manufacturer's products and per the manufacturer's recommendations.

- C. Spare Parts:
 - 1. Provide one (1) additional unit of each kind of equipment listed below:
 - a. High Flow Side Slope Pump
 - b. Low Flow Side Slope Pump
 - c. Pressure Transducer for low flow pump
 - d. Pressure Transducer for high flow pump
 - e. 3-inch 316 stainless steel pump disconnect adapter
 - f. 2-inch Air Release Valve
 - 2. Spare equipment shall be provided in its original packaging and contain copies of installation and operation manuals.
 - 3. All spare parts shall be provided to, and logged in by, the City's Representative.

1.4 WARRANTY

- A. The pump manufacturer shall warrant the pumps, including components and motor, against defects in workmanship and materials for a period of one (1) year under normal use and service beginning upon receipt Notice of Substantial Completion.
- B. Pump manufacturer warranties shall be in published form and apply to all similar units.

1.5 QUALITY ASSURANCE AND QUALITY CONTROL

- A. All electrical equipment and materials specified herein shall be listed by and shall bear the label of Underwriters Laboratories (UL), Factory Mutual (FM) or other nationally recognized testing laboratory acceptable to the State of Alaska Mechanical Inspections Division. All control panels shall be manufactured by a UL 508A panel shop and shall be UL listed as an assembly.
- B. Perform equipment tests to assure supplied pumps perform as specified. Tests shall cover a range from shut-off to a minimum 20 percent beyond specified design capacity.
- C. Conduct test per above specifications on all supplied pumps at the specified RPM, generating a curve showing actual flow and head.
- D. Obtain the pumps and controls from one source and a single manufacturer.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Subject to conformance with the Contract Documents, the following manufacturers are acceptable:
 - 1. EPG Companies, Inc.

- a. High Flow Side Slope Pumps: Model WSDPT 31-2
- b. Low Flow Side Slope Pumps: Model WSDPT 5-3

2.2 PERFORMANCE AND CONDITIONS OF SERVICE

- A. The pumps shall operate over the range of flows and heads specified below. Motor horsepower shall not exceed the value specified.

High Flow Side Slope Pumps					
Flow, gpm	0	50	100	150	200
Head, feet (One pump in operation)	104	93	80	61	29
Number of Pumps	2 duty				
Design Point –One pump operation (gpm/ft)	138/66				
Motor Design	Submersible				
Max. Motor Horsepower:	5.0				
RPM	3,450 Constant Speed				
Voltage/Cycle/Phase	460/60/3				
Min. Discharge Diameter, inches	3				
Impeller Type	Enclosed				
Material Pumped	Leachate				

Low Flow Side Slope Pumps					
Flow, gpm	0	5	10	20	30
Head, feet (One pump operation)	83	78	72	59	39
Number of Pumps	2 duty				
Design Point – One pump operation (gpm/ft)	27/46				
Motor Design	Submersible				
Max. Motor Horsepower:	0.75				
RPM	3,450 Constant Speed				
Voltage/Cycle/Phase	460/60/3				
Min. Discharge Diameter, inches	1 ½”				
Impeller Type	Enclosed				
Material Pumped	Leachate				

- B. The total heads specified herein do not include internal pump losses.
- C. Pumps shall operate without cavitation or vibration within the indicated flow range with submergence of 10-inches above the pump centerline.

2.3 PUMP DESIGN

- A. The pumps shall be submersible type for horizontal installation, each connected to a discharge connection of a minimum diameter as specified herein. The pump shall include an integral level sensor.

2.4 PUMP CONSTRUCTION

- A. Provide pumps fabricated of the following materials:

Pump System Components	Material
Check Valve Housing	304 Stainless Steel
Check Valve	304 Stainless Steel
Check Valve Seat	Non-Metallic
Diffuser Chamber	304 Stainless Steel
Impeller Seat Ring	E-Glide™
Impeller	304 Stainless Steel
Motor Adapter	304 Stainless Steel
Inlet Screen	304 Stainless Steel
Pump Shaft	304/431 Stainless Steel
Coupling	329/420/431 Stainless Steel
Fasteners	304 Stainless Steel
Bearings	E-Glide™

Motor Components	Material (1/3 to 2 HP)	Material (3 to 10 HP)
End Bell Castings	304 Stainless Steel over Iron	Ni-Resist Type 1B
Stators Shell	301 Stainless Steel	316 Stainless Steel
Shaft Extension	303 Stainless Steel	17-4 Stainless Steel
Fasteners	316 Stainless Steel	316 Stainless Steel
Seal Cover	Tefzel	316 Stainless Steel
Shaft Seal	Viton	Viton, Carbon, Ceramic Face Seal
Diaphragm	Viton	Type 200 Hydrin
Diaphragm Plate	304 Stainless Steel	304 Stainless Steel
Diaphragm Spring	302 Stainless Steel	302 Stainless Steel
Diaphragm Cover	316 Stainless Steel	316 Stainless Steel
Slinger	Viton	Nitride Rubber
Lead Sleeve	316 Stainless Steel	316 Stainless Steel
Lead Jam Nut	316 Stainless Steel	316 Stainless Steel
Lead Potting	Epoxy	Epoxy
Lead Bushing	Viton	Viton

Cells II-1 and II-2 Landfill Expansion

- B. Furnish pump case, impeller, intermediate housing, and motor housing with smooth surfaces devoid of blow holes and other irregularities.
 - C. Pump shall be equipped with wheels to facilitate installation and removal of pump.
 - D. Pump and motor shall be designed for horizontal submersible use, rated for Class 1, Division 2 environment.
 - E. Pump shall be equipped with 304 stainless steel disconnect adapter, Series NW by EPG Companies or equal.
- 2.5 AIR RELEASE VALVES
- A. Air release valve shall be constructed to release gasses in leachate line without spurting.
 - B. Materials of construction:
 - 1. Base: Plastic
 - 2. Base O-Ring: Buna N
 - 3. Body and Kinetic Float: Glass fiber reinforced nylon
 - 4. Automatic Float: Polypropylene
 - 5. Orifice: Brass/Stainless Steel
 - C. Acceptable Manufacturer: EPG or equal
- 2.6 CONTROLS
- A. Refer to Division 17.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. See Mechanical General Provisions, Section 15010.
- B. Install pumps as shown on the Drawings and as recommended by the manufacturer.

3.2 START-UP SERVICE

- A. The installed equipment, mechanical and electrical systems shall be prepared and adjusted for operation, placed into operation and tested to confirm proper operation. Authorized representatives of the manufacturer of each equipment and system shall conduct and/or remotely direct or assist with installation verification, preliminary adjustment and initiation of operation and testing of the equipment and systems.

- B. **Prior to the arrival of the authorized manufacturer’s representative, all mechanical, electrical, instrumentation and control work shall be completed.**
- C. **The pump system shall be tested with clean water.**
- D. The Contractor shall coordinate with the equipment manufacturers and facilitate the startup, testing and training.
- E. The Contractor shall arrange for, and pay all costs associated with the services of the manufacturer’s representatives, for all equipment supplied by the Contractor.
- F. The equipment manufacturer shall furnish the services of a qualified factory-trained field service engineer for a two day site visit combining an 8-hour session to inspect, check, service, adjust, and make corrections to the installation if required, and a 4-hour training session to instruct the Owner’s personnel on the operation and maintenance of the pumping units. Additionally, after the pumps have been completely installed and wired, the Contractor shall have the manufacturer do the following:
 - 1. Megger stator and power cables
 - 2. Check for proper rotation
 - 3. Check power supply voltage
 - 4. Measure motor operating load and no-load current
 - 5. Check level control operation and sequence
- G. Manufacturer’s representative shall submit a written report certifying that the equipment has been properly installed.

3.3 CLEANING

- A. All materials and equipment shall be new, and therefore, shall require only a minimum amount of cleaning during or after installation.
- B. All debris, grit, petroleum products, rust scale, construction by-products, and foreign matter shall be removed and damaged coatings repaired prior to final acceptance. All cleaning regimen recommended by the manufacturer shall be done.

END OF SECTION

SECTION 13140 - SIDE SLOPE PUMP RISER ENCLOSURES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section specifies FRP enclosures for the side slope pump risers. Cell II-1 and Cell II-2 each have a dedicated enclosure for a total of two enclosures.
- B. Related Work
 - 1. Refer to Drawing M-203 for mechanical details and S-201 for details of the concrete slab foundation for the enclosure.
 - 2. Division 3 –Concrete
 - 3. Section 15050 – Piping Systems

1.2 SUBMITTALS

- A. In accordance with the requirements of Section 01300, submit the following data:
 - 1. Detailed shop drawings of the enclosure, including hardware, anchorage system and pipe penetration locations.
 - 2. Structural design calculations sealed by a Professional Engineer registered in the State of Alaska for the enclosure and the enclosure connection to the foundation.

PART 2 - PRODUCTS

2.1 ENCLOSURE

- A. Enclosure shall be a molded, one-piece, all weather building with all stainless steel hardware. The enclosure shall be manufactured by Plaschem Supply and Consulting, Inc., Anchorage, AK; TRACOM, Inc., Alpharetta, GA; or approved equal and shall meet the following requirements:
 - 1. Dimensions:
 - a. 5'-0" Wide x 9'-4" Long minimum outside dimensions
 - b. 7'-0" minimum interior height
 - c. The foundation is designed around the specified dimensions. Any deviation from the specified dimensions shall be submitted to the Engineer for review. Any deviations in the plan dimension shall require Contractor to adjust the foundation accordingly.
 - 2. Structure walls shall be specially constructed to match the concrete foundation walls. The concrete foundation has one wall taller than the others, see drawing S-201.
 - 3. Structure shall withstand the following conditions:
 - a. Wind Loading (ASCE 7-05) Basic wind speed (3 sec. gusts) 165 mph (Category III)
 - b. Snow Loading (ASCE 7-05) Ground snow load = 50 PSF, Snow Exposure Factor $C_e = 0.7$, Roof snow load $P_f = 50$ PSF

- c. Seismic Loading – Unalaska is located in a high seismic activity area – use “Zone 4” criteria.
4. Shelter shall be molded monolithic fiberglass reinforced polyester laminated, plywood and foam core construction.
5. Shelter walls and roof of shelter shall be a sandwich construction with no less than 1/8 inch FRP (Fiberglass Reinforced Polyester) laminate with a minimum of 15 mills Polyester gel-coat applied to the exterior. 2 ½” metal studs on 24” centers set into 3 ½” track shall be bonded to the exterior laminate leaving a 1” space in front of studs, the entire 3 ½” cavity shall then be filled with 2.5# class II urethane foam. AC plywood ½” thickness shall then be fastened to studs and track. FRP laminate 1/16” thick shall then be applied over entire interior of shelter, resin for interior shall be fire retardant and meet ASTM E-84 fire rating. A Gel-coat shall then be applied over the entire interior of shelter. Wall thickness shall be a minimum of four inches. R-value of walls and roof R-26.
6. Door frame and hardware for doors shall be molded as part of shelter shell.
Provide an insulated weather-resistant access doors, 2 x 36” W x 72” H centered on the wall horizontally opposite the riser pipes. The opening shall start 6” above the bottom of the structure. Structure shall have a removable 9 ½” center section the doors latch into. Doors hinges shall be located on the outside of the overall opening, such that the doors open from the center out permitting unobstructed access to the flange side of the riser pipes. Door shall be one piece with the same sandwich construction as shelter walls. Neoprene gasket shall provide continuous seal of door to frame. All hardware shall be stainless steel, which includes three hinges per door and freezer style door latch(es) as required for the design wind speed.
7. Refer to electrical drawings for lighting, heat tracing and general electrical requirements. Provide suitable mounting for all electrical gear.
8. Provide stainless steel anchor bolts and waterproofing neoprene gasketing to secure the enclosure to the foundation slab. Anchor bolt size and spacing to be designed by building manufacturer to withstand design conditions described herein.

PART 3 - EXECUTION

3.1 EXAMINE SLAB

- A. Verify that the concrete foundation is constructed with level walls, true to plane, and the correct dimension to receive the enclosure. Verify the size and spacing of anchor bolts.

3.2 INSTALLATION

- A. Install the enclosure in strict conformance with the manufacturer's instructions and requirements.
- B. Install the anchor bolts and neoprene gasket as detailed on shop drawings.
- C. Use lifting eye(s) (and spreader bar if more than one eye provided) to set the enclosure building.
- D. Verify the operation of the doors as the anchor bolts are tightened – adjust as necessary to prevent binding of the doors.
- E. Seal around the perimeter flange of the enclosure with 3M 4200 caulk.

END OF SECTION

SECTION 15010 – MECHANICAL GENERAL PROVISIONS

PART 1 - GENERAL

1.1 SUMMARY

Provisions of this Section shall apply to all sections in Division 15.

1.2 RELATED WORK

A. The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractor's responsibility to perform all the work required by the Contract Documents.

1. Section 02614 – HDPE Pipe and Fittings
2. Section 15050 – Piping Systems
3. Section 15068 – Stainless Steel Pipe and Fittings
4. Section 15080 – Valves
5. Section 15130 – Pressure Gauges

1.3 SUBMITTALS

A. Descriptive literature or shop drawings for all equipment, pipes, fittings, valves, etc., in accordance with Section 01300.

1.4 STANDARDS

- A. Pipe fittings, wiring, and supports shall be provided to produce complete, operable systems, with all elements properly interconnected as shown in schematic diagrams, or to provide specified operations.
- B. If a specified dimensioned location is not shown for interconnections or smaller system elements, the Contractor shall select appropriate locations and shown them on Shop Drawing submittals for review.
- C. Equipment and material shall be new and without imperfections and shall be erected in a neat and workmanlike manner; aligned, leveled, cleaned, and adjusted for satisfactory operations; installed in accordance with the recommendations of the manufacturers and the best standard practices for this type of work so that connecting and disconnecting of piping and accessories can be readily made and so that all parts are easily accessible for inspection, operation, maintenance and repair.
- D. Meet requirements of local and state codes.
- E. Provide manufacturer's certification that materials meet or exceed minimum requirements as specified.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Exercise care in transporting and handling to avoid damage to material.
- B. Store materials on the site so as to prevent damage or theft.
- C. Keep materials clean, dry, and free from deleterious conditions.
- D. Do not store materials directly on the ground.
- E. Repair or replace damaged material or equipment to the satisfaction of Owner.
- F. Protect electrical equipment, controls, and insulation against moisture and water damage.
- G. The Contractor shall be responsible for the equipment included in this Contract until it has been finally inspected, tested, and accepted in accordance with the requirements of these Specifications.

1.6 QUALITY ASSURANCE AND QUALITY CONTROL

- A. All electrical equipment and materials specified herein shall be listed by and shall bear the label of Underwriters Laboratories (UL), Factory Mutual (FM) or other nationally recognized testing laboratory acceptable to the State of Alaska Mechanical Inspections Division. All control panels shall be manufactured by a UL 508A panel shop and shall be UL listed as an assembly.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. In accordance with applicable section of Division 15.
- B. All equipment and material shall be designed for the service intended; shall be of rugged construction; of ample strength for all stresses which may occur during fabrication, transportation, erection, and during continuous or intermittent operation; shall be adequately stayed, braced, and anchored; and shall be installed in a neat and workmanlike manner.
- C. Appearance and safety as well as utility shall be given consideration in the design of details.
- D. Materials of construction shall be cathodically compatible.
- E. Design, fabricate, and assemble equipment and systems with new materials and in accordance with acceptable modern engineering and shop practices.

- F. Manufactured individual parts to standard sizes and gauges so repair parts can be installed in the field. Make like parts of duplicate units interchangeable.

2.2 ANCHOR BOLTS

- A. Anchor bolts shall be Stainless Steel construction, adequately sized for equipment loads and, in no case, less than the size recommended by the equipment manufacturer.
- B. EMBEDDED SLEEVE TYPE
 1. Preferred method.
 2. When allowed by equipment manufacturer.
 3. Anchor bolt assembly shall consist of anchor bolt, surrounding pipe sleeve, bottom plate, leveling nut, nut and washer.
 4. Assembly shall permit reasonable lateral movement of the bolts to allow for proper matching of bolts to equipment.
- C. EMBEDDED TYPE: When required by equipment manufacturer or field conditions.
- D. CONCRETE ANCHOR TYPE: When allowed by Specifications or shown on Drawings.

2.3 PAINTING MANUFACTURED EQUIPMENT

- A. Manufacturer shall shop finish steel or iron starters and other self-contained or enclosed components with oil-resistant enamel.
- B. Protect all other steel and iron surfaces with two part epoxy coating.
 1. Primer and Finish Coat shall be 2 coats 2.5 to 3.5 mils DFT, Epoxoline II Series 69 by Tnemec, or equal.
- C. Coat surfaces to be painted after installation with a coat of primer to protect equipment until finish coat is applied.
- D. Protect for life of equipment surfaces which will be inaccessible after assembly.
- E. Finish smooth, thoroughly clean, and fill exposed surfaces as necessary to provide smooth, uniform base for coating.
- F. Apply rust preventative compound to all machined, polished, and non-ferrous surfaces that are not be painted.
- G. Furnish paint in appropriate quantities for field touchup of equipment.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENT

- A. In accordance with applicable section of Division 15.
- B. Cooperate with all trades in furnishing material and information for correct location, in proper sequence, of all sleeves, bucks, inserts, foundations, wiring, etc.
- C. Piping connections to equipment shall be made with unions or flanges to permit dismantling. Flanges and unions shall also be installed in the piping systems to permit disassembly consistent with good installation practice and as required for the removal of connected equipment from place of installation.
- D. Belt drives, flexible couplings, and other exposed rotating or reciprocating parts shall be covered with approved safety covers. Covers shall be permanent type and easily removable.
- E. Motor and bearings shall be covered with watertight and dustproof covers during construction period.
- F. **SLEEVES**
 - 1. Sleeves through outside walls above grade shall be caulked with approved caulking.
 - 2. Below grade shall be sealed with link seals, or as shown on the drawings.
 - 3. Pipe through walls and floors where exposed to view shall have cover plates.

3.2 COORDINATION OF WORK

- A. Plan all work so that it proceeds with a minimum of interference with other trades.
- B. Openings required in the construction for the installation of the work under this division of these Specifications shall be coordinated with the work of all other trades.
- C. Contractor shall pay for all extra cutting and patching made necessary by his failure to properly direct such work at the correct time.

3.3 INTERFERENCE

- A. Contractor shall arrange the run of the piping in such a manner that it does not interfere with grilles, light outlets, light fixtures, or other equipment.
- B. Pipe shall normally be run parallel to walls, ceiling, or floor.

3.4 INSULATING COUPLING

- A. Furnish and install at all interconnections between piping systems of dissimilar materials and at all connections of piping systems to equipment where piping and equipment are of dissimilar materials.
- B. Couplings shall be specifically designed for the purpose of electrically isolating pipe lines from other piping systems or equipment.

3.5 WELDED INSTALLATION

- A. Shop fabricated to maximum extent possible.
- B. Use welders certified in accordance with the latest requirements of the American Welding Society "Standard Qualifications Procedures."
- C. Repair protective coating and linings to a condition equivalent to the factory-applied coating or lining.
- D. Install coupling at ends of pipe to be welded to provide access for replacing protective lining.

3.6 PIPE OPENINGS

- A. Openings in pipes shall be kept closed during the progress of the work.

3.7 VALVES

- A. Provide valves at each piece of equipment to isolate equipment from its connected system.
- B. Valves shall not be placed with stems below horizontal.
- C. Provide chain wheel operators for all valves greater than 7'-6" above finished grade.

3.8 ACCESS TO EQUIPMENT

- A. All motors, valves, control devices, specialties, etc., shall be so located as to provide for easy access for operation, repair, and maintenance.

3.9 LUBRICATION

- A. Provide lubrication for the operation of all equipment until acceptance.
- B. Provide with a chart listing each piece of equipment, the proper type of oil or grease required, and recommended frequency of lubrication.
- C. Contractor shall be required to run in all bearings and, after they are run in, shall drain and flush bearings and refill with a new oil change.

- D. Oil and lubrication fittings shall be located within reach from the operating surface. In order to meet these requirements with equipment as furnished, minor deviation from the Drawings may be made as favorably reviewed by the Owner.

END OF SECTION

SECTION 15050 – PIPING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This section covers general requirements for piping systems specified herein, and as further specified in detailed piping specifications found in other sections of Division 2 and 15. All work under this section shall comply with all applicable City and State codes and ordinances.
- B. All pipe sizes on the Drawings and specified herein, are in reference to “nominal” diameter unless otherwise indicated.

1.2 RELATED WORK

- A. The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractor’s responsibility to perform all the work required by the Contract Documents.
 - 1. Section 02614 – HDPE Pipe and Fittings
 - 2. Section 15068 – Stainless Steel Pipe and Fittings
 - 3. Section 15080 – Valves

1.3 SUBMITTALS

Submit under provisions of Section 01300 – Submittal Procedures, the following information:

- A. Manufacturer's technical data for all piping, and documentation of conformance with appropriate standards and these specifications.
- B. Detailed drawings, conforming to the requirements listed below, shall be submitted for the following locations and items:
 - 1. Concrete wall pipe penetrations into side slope pump riser enclosure.
 - a. 16-inch Riser Pipes in each enclosure
 - 2. Fiberglass wall pipe penetrations in side slope pump riser enclosure.
 - a. 1-inch air vent pipe in each enclosure
 - 3. Pipe supports in side slope pump riser enclosure for the following:
 - a. Air vac release valves in each enclosure

PART 2 - PRODUCTS

2.1 PIPE IDENTIFICATION

- A. All pipe shall be clearly marked with the manufacturer’s name, type, nominal

diameter, class, thickness and manufacture date and location. Lettering shall be legible and permanent under normal conditions of handling and storage.

- B. Above Ground Pipe - Plastic Coding Markers:
 - 1. Markers shall be the mechanically attached type that are easily removable; they shall not be the adhesive applied type.
 - 2. Markers shall consist of pressure sensitive legends applied to plastic backing which is strapped or otherwise mechanically attached to the pipe. Legend and backing shall be resistant to petroleum based oils and grease and shall meet criteria for humidity, solar radiation, rain, salt, fog and leakage fungus, as specified by MIL-STD-810C.
 - 3. Markers shall withstand a continuous operating temperature range of -40 degrees F to 180 degrees F. Plastic coding markers shall not be the individual letter type but shall be manufactured and applied in one continuous length of plastic.
 - 4. In addition, pipe markers shall include uni-and bi-directional arrows in the same sizes as the legend. Legends and arrows shall be white on blue or red backgrounds and black on yellow or green backgrounds.
 - 5. Plastic markers for coding pipe shall conform to ANSI A13.1 and shall be as manufactured by W.H. Brady Company, Seton Name Plate Corporation, or equal.

- C. Buried Pipe – Detectable Warning Tape
 - 1. Detectable Warning Tape shall meet the requirements of Section 02316, Trench Excavation and Backfill.

2.2 ANCHORAGE:

- A. Bends and tees in pressure piping systems shall be anchored in accordance with the requirements of ANSI B31.1, unless specified otherwise.

2.3 WALL AND FLOOR PENETRATIONS:

- A. Wall penetrations in the Pump Riser Enclosure shall be as follows:
 - 1. Concrete Wall Penetrations
 - a. Flexible Rubber product designed to provide flexible pipe to concrete wall connection.
 - b. Connector is grouted directly in to concrete wall to provide a positive watertight seal with up to 25° omni directional deflection and 1.5 inch vertical and horizontal movement.
 - c. Inner O-Ring design eliminates rubber wrinkling, insuring a watertight seal.
 - d. Connector shall be made from EPDM Rubber and Stainless Steel bands for hardware that conform to Section 4, “Materials and Manufacturer” of ASTM C-923 “Standard Connectors between Resilient Concrete Manhole Structures and Laterals”.

- e. Required Accessories: Field Sleeve designed for 10" Flat Wall and selected connector. Field sleeve and connector shall be provided as a matched set by a common supplier.
 - f. Connector shall be Z-LOK, model C107-15, manufactured by A-LOK Products, Inc. or equal.
2. Fiberglass Wall Penetrations
- a. Enclosure manufacturer shall provide molded penetration. See related Section 13140. Location of penetrations to be coordinated by Contractor, see related drawing submittal requirement above.
- B. Floor penetrations in the Pump Riser Enclosure shall be as follows:
- 1. Into Pump Riser: Pipes penetrating the floor shall pass through a pipe sleeve and be grouted in to place using non-shrink grout.
- C. Wall penetrations into Manholes shall be NPC Kor-n-Seal with stainless steel hardware, by Trelleborg or equal.

2.4 PIPING AND FITTINGS

- A. All pipe, fittings, and apparatus associated with this project shall have restrained joints or fittings.
- 1. Restrained joints shall be one of the following, based on material type and pipe size:
 - a. Thermal Butt Fusion
 - b. Restrained mechanical joint
 - c. Flanged
 - d. Threaded
 - e. Solvent welded
- B. Detailed specifications for a particular pipe can be found in other sections of Division 15.

2.5 PIPE INSULATION

- A. Piping above grade and in the Riser Enclosure shall be insulated. Insulation shall be:
- 1. Factory Mutual approved, black, flexible, tubular foam with 1-1/2 inch wall thickness.
 - 2. Dust free, fiber free, closed cell foam with Microban microbial protection meeting UL1B1 mold growth rating, ASTM G21 Fungi resistance.
 - 3. Non water adsorbing: Retaining less than 0.2% by volume per ASTM C209.
 - 4. Density ranging between 3 and 6 lbs/cf.

5. Thermally insulative permitting less than 0.27 BTU in/(hr*sf*F deg) at 76 degrees F.
6. AP/Armaflex by Armacell Engineered Foams or Equal.
7. Provide factory recommended exterior sheathing to protect the installed insulation.

PART 3 - EXECUTION**3.1 LOCATION:**

Piping shall be provided as specified except for adjustments to avoid architectural, mechanical and structural features and shall be coordinated with electrical construction.

3.2 INSTALLATION OF PIPING

- A. All piping shall be installed to the lines and grades shown on the Drawings. All above ground piping shall be installed plumb and level.
- B. Contractor's shall dry-fit all piping and take appropriate measures on ensure piping is installed plumb and level.
- C. Above ground piping shown on the Drawings to be flexible piping or hose shall be adequately supported so no sags or dips are in the pipe run. Where flexible pipe or hoses are shown to run level, pipe shall be secured tautly between supports. Flexible pipes and hoses shown between connections and equipment shall be installed with enough slack in the pipe or hose to allow for easy disconnect from equipment.
- D. Insulate above ground piping within Pump Riser Enclosures. Secure insulation per manufacturer's recommendations.
- E. Allow sufficient space for the proper installation of the pipe covering. If piping is installed too close to other piping or equipment, the piping shall be moved to avoid such interferences.
- F. Piping diagrams are schematic only and must not be used for obtaining lineal runs or number and type of fittings and fixtures.
- G. The drawings do not attempt to show exact details of all piping. No extra payments will be allowed where obstructions in the work of other trades, or work under this contract, require offsets in piping.
- H. Keep end of pipe closed during the progress of the work.
- I. All connections to equipment shall be made with unions so that equipment can be removed or serviced without dismantling the piping.

- J. Place all piping in proper alignment and position prior to connection to anchors, expansion loop and equipment. Furnish jacking devices, temporary steel structural members and assembled structures as necessary. Remove temporary equipment and structures supplied by the Contractor at completion; such items to remain the Contractor's property.
 - K. All piping shall be properly supported or suspended on stands, clamps, hangers, etc., of approved design and make as directed. Supports shall be designed to permit free expansion and contraction while minimizing vibration. Pipes shall be anchored where shown or directed by means of steel clamps or other accepted means, securely fastened to the pipe and rigidly attached to the building.
- 3.3 TRENCHING, BEDDING, BACKFILL AND COMPACTION
- A. Unless otherwise specified, trenching, marking with Detectable Warning Tape, pipe bedding, backfill and compaction for piping shall be in accordance with Section 02316 of these Specifications.
- 3.4 CLEANING, FLUSHING, TESTING - GENERAL
- A. All solid wall flexible and rigid pipe shall be flushed, cleaned, pressure tested per Table 3.4. Piping systems connected to operating, control, regulating or instrumentation equipment shall receive a final flushing with the appropriately sized screens temporarily installed.
 - B. Unless specified otherwise, piping 24 inches in diameter and smaller shall first be cleaned by pulling a tightly fitting cleaning ball or swab through the system.
 - C. Contractor shall be responsible for determining how to discharge the flushing and testing waters.
 - D. Upon completion of piping, but prior to application of insulation on exposed piping, the Contractor shall test the piping systems.
 - E. Equipment which may be damaged by the specified test conditions shall be isolated.
 - F. Testing shall be performed using calibrated test gauges and calibrated volumetric measuring equipment to determine leakage rates. Each test gauge shall be selected so that the specified test pressure falls within the upper half of the gauge's range.
 - G. The Contractor shall notify the Engineer a minimum of 24 hours prior to each test.

- H. No separate or extra payment shall be made for cleaning, flushing or testing. All costs associated with cleaning, flushing and testing the piping systems shall be included in the applicable unit price or part of the lump sum bid price.

Table 3.4: Required Flushing and Testing per System			
Piping System (media)	Flushing	Hydrostatic Leak Test	Final Flush with Screens
Corresponding Specification Subsection	3.4 & 3.5	3.6	3.7
Gravity (Leachate and Stormwater)	Per Section 02614		
Force Main - Leachate	Yes	Yes	Yes
SD1 and SD2: HDPE Force Main - Stormwater	No	Yes	No
Pressure Piping Pump Riser Enclosure	Yes	Yes	No

3.5 FILLING AND FLUSHING PIPE

- A. Lines shall be filled slowly with potable water at a maximum velocity of 1 ft/s (0.3 m/s) while venting all air. Precautions shall be taken to prevent entrapping air in the lines. After filling, lines shall be flushed at blowoffs and dead ends at a minimum velocity of 3 ft/s (1 m/s). A minimum of three water changes of treated water shall be used in flushing operations. Valves shall be closed slowly to prevent excessive surges while maintaining positive pressure at all times throughout the new line.
- B. Flushing water shall be discharged without causing erosion damage, nuisance or interruption of traffic.
- C. A special pipeline pig may be required when the required flushing velocity cannot be achieved or when needed to conserve water. The Contractor shall make provisions for launching and retrieving the pig at no cost to the Owner.

3.6 HYDROSTATIC TESTING OF PRESSURE PIPE

- A. Test Restrictions.
 - 1. Test pressure shall meet the requirements of paragraph 3.6 B below at the highest point along the test section.
 - 2. Test pressure shall not exceed pipe design pressures.
 - 3. The hydrostatic test shall be of at least a 2-hr duration.
 - 4. Test pressure shall not vary by more than ± 5 psi (34.5 kPa) for the duration of the test.
 - 5. Tests shall be conducted either against blind flanges or against closed valves. Valves shall not be operated in either direction at a differential pressure exceeding the rated valve working pressure. Use of a test pressure greater than the rated valve pressure can result in trapped test

pressure between the gates of a double-disc gate valve. For tests at these pressures, the test setup should include a provision, independent of the valve, to reduce the line pressure to the rated valve pressure on completion of the test. The valve can then be opened enough to equalize the trapped pressure with the line pressure, or fully opened if desired.

- B. Pressurization. After the pipe has been laid, all newly laid pipe, or any valved section thereof, shall be subjected to a hydrostatic pressure of at least 1.5 times the working pressure at the point of testing or to the pressure specified elsewhere. Each valved section of pipe shall be slowly filled with water, and the test pressure (based on the elevation of the lowest point of the line or section under test and corrected to the elevation of the test gauge) shall be applied by means of a pump connected to the pipe. The system should be allowed to stabilize at the test pressure before conducting the hydrostatic test.
 - 1. Leachate and Stormwater Force Main SD 1 and SD 2: Test Pressure = 50 PSI
 - 2. Pressure Piping Pump Riser Enclosure: Test Pressure = 50 PSI
- C. Air Removal. Before applying the specified test pressure, air shall be expelled completely from the section of piping under test.
- D. Examination. All exposed pipe, fittings, valves and joints shall be examined carefully during the test. Any damage or defective items that are discovered following the pressure test shall be repaired or replaced with sound material, and the test shall be repeated until satisfactory results are obtained.
- E. Testing Allowance. No pipe installation will be accepted if the pressure drop is greater than 5 PSI over the duration of the test. No leakage allowed.

3.7 FINAL FLUSHING

- A. Temporary Screens: Upon completion of the cleaning, the Contractor shall place a 1/4" temporary screen at the end of the force main prior to connecting to the existing leachate system.

The Contractor shall maintain the screen during testing, initial start-up, and initial operating phases of the commissioning process. In special cases, screens may be removed as required for performance tests. The Contractor shall remove the temporary screens and make the final piping connections after the screens have remained clean for at least 24 consecutive hours of operation. Systems handling solids are exempt.

END OF SECTION

SECTION 15068 – STAINLESS STEEL (SS) PIPE AND FITTINGS**PART 1 - GENERAL**

1.1 SUMMARY

The work covered in this section includes furnishing, installing and testing Stainless Steel (SS) Pipe and accessories, complete, including all labor, materials, tools, equipment and performing all other work and incidentals necessary to provide Stainless Steel pipe and accessories in accordance with the Drawings and these Specifications. SS pipe shall be installed in close conformity with the lines and grades shown on the Drawings or established by the Engineer.

1.2 REFERENCED SECTIONS

- A. The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractor's responsibility to perform all the work required by the Contract Documents.
1. Section 02614 – HDPE Pipe and Fittings
 2. Section 15050 – Piping Systems
 3. Section 15080 – Valves
 4. Section 15130 – Pressure Gauges

1.3 QUALITY ASSURANCE

- A. Referenced Standards: This Section incorporates by reference the latest revision of the following documents. These references are a part of this Section as specified and modified. In case of conflict between the requirements of this Section and those of a listed document, the requirements of this Section shall prevail.
1. ASTM A240: Specification for Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels
 2. ASTM A572: High Strength Low-Alloy Columbium-Vanadium Steels of Structural Quality
 3. ASTM A774: Specification for As-Welded Wrought Austenitic Stainless Steel Fittings for General Corrosive Service Low and Moderate Temperature
 4. ASTM A778: Welded Unannealed Austenitic Stainless Steel Tubular Product
 5. ASTM A36: Standard Specification for Carbon Structural Steel
 6. ANSI B16.1: Cast Iron Pipe Flanges and Flanged Fittings
 7. UPC (2006): Uniform Plumbing Code

1.4 SUBMITTALS

- A. Submit under provisions of Section 01300 – Submittal Procedures.
- B. Prior to shipping any material to the site, submit the following:
 - 1. Manufacturer's product data including pipe, pipe accessories, and appurtenances. Provide manufacturers certificates for materials that meet or exceed these Specifications.
- C. Shop Drawings:
 - 1. Detailed drawings shall be submitted per the requirements of Section 15050 – Piping Systems.
- D. Certifications
 - 1. Certification of conformance with ASTM A380 for handling and cleaning of stainless steel.

1.5 PRODUCT DELIVERY STORAGE AND HANDLING

- A. Labeling: The following information shall be continuously marked on the pipe and spaced at intervals not to exceed 5 feet:
 - 1. Name and/or trademark of the pipe manufacturer
 - 2. Nominal pipe size
 - 3. Thickness Classification
 - 4. Material Classification
 - 5. Manufacturing Standard Reference
 - 6. A production code from which the date and place of production can be determined
- B. Transportation is the responsibility of the Contractor, who shall be liable for all damages prior to and during transportation to site.
- C. During shipment and storage, the pipe shall be wrapped in relatively impermeable and opaque protective covers.
- D. Inspect materials delivered to the site for damage. Unload and store with minimum of handling. Store materials on-site in enclosures or under protective coverings. Store pipe and fittings in a flat, horizontal position, and under cover, out of direct sunlight. Do not sort materials directly on the ground. Keep inside of piping free of dirt and debris.
- E. Handling, storage, and care on-site are the responsibility of the Contractor prior to, during and after installation. Handle pipes, fittings, and other accessories in a manner that ensures delivery to the point of installation in sound, undamaged condition. Do not drop pipe. Carry, do not drag, pipe to the point of installation.

PART 2 - PRODUCTS

2.1 PIPING SYSTEMS

1. Piping systems containing stainless steel pipe and/or fittings include:

TABLE 1 – PIPE SCHEDULE			
System	Nominal Diameter	Schedule	Grade
Pressure Piping in Pump Riser Enclosure	1” - 3”	40	316

2.2 STAINLESS STEEL PIPE

A. GENERAL

1. The fabricated stainless steel pipe and fittings shall be furnished by a single fabricator. The pipe and fittings shall be shop fabricated and field installed in accordance with approved shop drawings.
2. The submittal shall include dimensions, fittings, locations of equipment, valves, and appurtenances, joint locations and details, types and locations of supports, coordination with all other work.
3. Shop fabrication spool drawings shall show alloys, diameters, pipe wall thickness, fittings, threadlets, branches, flanges, grooves and other joint preparation details, dimensions, and other appurtenances to be supplied.

2.3 PIPE

- A. Pipes shall be manufactured from ASTM-A240 annealed and pickled sheets and plates in accordance with ASTM A778 in Grade TP 316L stainless steel per the Table 1 – Pipe Schedule.
- B. Pipe shall be manufactured to nominal pipe sizes as listed in ANSI B36.19, Table 2, and shall have the following nominal wall thickness:

Nominal Pipe Size (IN.)	Actual O.D. (IN.)	Schedule/Gauge/ Plate	Nom. Wall Thickness (IN.)
1	1.315	Sch. 40	0.14”
2	2.375	Sch. 40	0.16”
3	3.500	Sch. 40	0.22”
4	4.500	Sch. 40	0.24”

- C. The finish on the raw material, manufactured to ASTM A-240 will be No. 1, HRAP (hot rolled annealed and pickled) or better. The finish on the completed pipe and fittings shall be as specified in ASTM A778 and A774, respectively.

2.4 SPOOLS

- A. Fabricated spools shall be provided with the end treatments called out on the Drawings.
- B. Flange end spools shall be made of material matching the pipe with threaded flange faces or weld on slip-over type rolled angle face rings and rated to ANSI 16.1 class 125 standard. The angle face ring thickness shall be equal to or greater than the wall of the pipe or fitting to which it is welded and it shall be continuously welded on both sides to the pipe or fitting.

2.5 FITTINGS/NIPPLES

Fittings and pre-fabricated nipples shall be threaded NPT. All fittings shall be a minimum of schedule 40, grade TP 316 stainless steel and shop fabricated

2.6 UNIONS

- A. Unions shall meet the following requirements:
 - 1. Grade TP 316 stainless steel
 - 2. Class 150, ANSI B1.20.1 and operating pressure of 300 PSI for Water or Gas
 - 3. NPT threaded connections

2.7 GASKETS

- A. Full Face Flange and Other Gaskets
 - 1. Leachate gaskets shall be Viton by Dupont or equal.

2.8 HARDWARE

- A. Bolts and nuts shall be 316 stainless steel.

PART 3 - EXECUTION

3.1 GENERAL

- A. After the manufacture of individual stainless steel fittings and pipe assemblies, they shall be pickled by immersion in a tank containing an ambient nitric hydrofluoric acid solution made up from Oakite Deoxidizer SS, or equal.
- B. The duration of immersion shall be 15 to 20 minutes and may be supplemented by manually scrubbing or brushing with non metallic pads or stainless steel wire brushes. The acid treatment shall be followed by immersion in a rinse water tank, followed if necessary by a spray rinse. The stainless steel products shall then be allowed to air dry to achieve passivation.

- C. Welding of pipe spools shall be performed using welders and procedures qualified in accordance with ASME Section IX. Piping with wall thicknesses up to and including 11 gauge (0.125”) shall be welded with the TIG (GTAW) process. Heavier walls shall be beveled according to procedure, root pass welded with the TIG (GTAW), and have subsequent weld passes performed using the TIG (GTAW), MIG (GMAW), or Metallic Arc (SMAW) process.
- D. After shop fabrication into pipe spools, exterior welds shall be manually scrubbed or brushed with non metallic pads or stainless steel wire brushes to remove weld discoloration, rinsed with clean water and allowed to air dry.
- E. Painting of the stainless steel pipe is not required. The contractor shall be responsible for supplying and installing the stainless steel piping with a consistently clean surface.

3.2 CLEANING / FLUSHING / TESTING

- A. Prior to testing, pipelines shall be cleaned to remove shavings, welding slag, dirt, construction debris, and other foreign material and flushed with clean water at a minimum of 3 fps velocity
- B. Cleaning, flushing and testing shall be done per Specification Section 15050 – Piping Systems.

END OF SECTION

SECTION 15080 – VALVES

PART 1 - GENERAL

1.1 SUMMARY

- A. This section covers the control valves required to operate and maintain the leachate collection system.
- B. All valves listed in this Section will be associated with piping carrying untreated landfill leachate which has been characterized as highly corrosive.

1.2 RELATED WORK

- A. The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractor's responsibility to perform all the work required by the Contract Documents.
 - 1. Section 02614 – HDPE Pipe and Fittings
 - 2. Section 15010 – General Mechanical Provisions
 - 3. Section 15050 – Piping Systems
 - 4. Section 15068 – Stainless Steel Pipe and Fittings

1.3 QUALITY ASSURANCE

- A. Referenced Standards: This Section incorporates by reference the latest revision of the following documents. These references are a part of this Section as specified and modified. In case of conflict between the requirements of this Section and those of a listed document, the requirements of this Section shall prevail.
 - 1. ANSI/ASME B16.21 Nonmetallic Flat Gasket for Pipe Flanges
 - 2. ANSI/ASME B16.34 Valves – Flanged, Threaded and Welding End
 - 3. ASTM A126 Gray Iron Castings for Valves, Flanges and Pipe Fitting
 - 4. ASTM A167 Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip
 - 5. ASTM A536 Ductile Iron Castings
 - 6. ASTM A537 Practice for Numbering Metals and Alloys
 - 7. AWWA/ANSI C111/A21.11 Standard for Rubber Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings
 - 8. AWWA C504 Resilient Seated Butterfly Valves
 - 9. UPC (1991) Uniform Plumbing Code

1.4 SUBMITTALS

Submit under provisions of Section 01300 – Project Data Submittals, as follows:

- A. Prior to shipping any material to the site, submit the following:
 - 1. Product data showing detailed technical information relating to each type of valve including description of component parts, materials of construction, performance, dimensions and weights.
 - 2. Cut sheets showing valve dimensions.
- B. Detailed drawings shall be submitted per the requirements of Section 15050 – Piping Systems showing:
 - 1. Air release valve support
 - 2. Pump Riser Enclosure pipe and fitting layout drawing, only required if ball valve is substituted for a plug valve.
- C. Installation instructions and operation and maintenance data for each type of valve.

PART 2 - PRODUCTS

2.1 LEACHATE BALL VALVES

- A. Manufactures: One of the following, or equal
 - 1. NIBCO, Inc
 - 2. Apollo Valves
- B. General:
 - 1. Type: Non-lubricated and capable of sealing in either direction
 - 2. End Connections: Threaded
 - 3. Stem Packing: Manually adjustable while valves is under pressure
 - 4. Shafts: Rigidly connected to the ball by a positive means. The connection shall be designed to transmit torque equivalent to 75% of the torsional strength of the shaft.
 - 5. Handles: Stainless steel latch lock handle with vinyl grip and stainless steel nut designed to open and close the valve under operating conditions
- C. Materials:
 - 1. Body: Type 316 Stainless Steel body
 - 2. Ball: Type 316 stainless
 - 3. Seats: PTFE or Viton
 - 4. Stem Seals: PTFE or Viton
 - 5. Bearings: Self-lubricating, corrosion resistant material
 - 6. Linings: None
 - 7. Coatings: None

Cells II-1 and II-2 Landfill Expansion

2.2 LEACHATE PLUG VALVES – CORROSION RESISTANT

- A. Manufactures: One of the following, or equal
 - 1. Durco T4E1
 - 2. A Flanged Ball Valve meeting the requirements of 2.1 Ball Valves above (with the exception of end connections) may be substituted for a plug valve provided the lengths are equivalent. Contractor shall revise fittings as required and submit shop drawings of proposed valve and piping layout for the Engineer’s review.

- B. General;
 - 1. Type: No-lubricating quarter turn valve
 - 2. End Connections: Raised face ANSI class Flanges
 - 3. Shafts: Rigidly connected to the plug by a positive means. The connection shall be designed to transmit torque equivalent to 75% of the torsional strength of the shaft
 - 4. Handle: Ductile iron with lockable wrench device

- C. Materials:
 - 1. Body: Ductile iron
 - 2. Plug: Ductile iron encapsulated PFA molded Plug
 - 3. Diaphragm: PTFE
 - 4. Lining: PTFE
 - 5. Coating: Fusion bonded epoxy

2.3 CHECK VALVES (IN PUMP ENCLOSURE)

- A. Manufactures: One of the following, or equal
 - 1. APCO 6000 Series

- B. General;
 - 1. Type: Swing style check valve
 - 2. End Connections: Flanged
 - 3. Options: Outside lever and weight

- C. Materials:
 - 1. Body: Ductile iron
 - 2. Disc: Ductile iron
 - 3. Disc Seat: Viton
 - 4. Trim: Stainless Steel
 - 5. Linings: Fusion bonded epoxy
 - 6. Coatings: Fusion bonded epoxy
 - 7. Gaskets: PTFE or Viton

2.4 AIR RELEASE VALVE

- A. See Section 11220 Side Slope Pumps.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Preparation: Required Information Prior to Installation
 - 1. Install valves after the required submittal on installation has been reviewed.
 - 2. Determine the face to face dimensions of flanged, wafer and lug valves and check valves.
- B. Fabricate pipes to lengths taking into account the dimensions of all valves.

3.2 INSTALLATION

- A. Provide incidental work and materials necessary for installation of valves including flange gaskets, flange bolts and nuts, valve boxes and covers, concrete bases, blocking, and protective coating.
- B. Where needed, furnish and install additional valves for proper operation and maintenance of equipment and facilities under the following circumstances:
 - 1. Where additional valves are required as a result of a substitution or change initiated by Contractor.
- C. Install valves with their stems in vertical position above the pipe, except as follows:
 - 1. Butterfly valves, gate valves aboveground, globe valves, ball valves, and angle valves may be installed with their stems in the horizontal position.
 - 2. Buried plug valves with geared operators shall be installed with their stems in a horizontal position.
- D. Install valves so that handles clear obstructions when the valves are operated from fully open to fully closed.
- E. Place top of valve boxes flush with finished grade or as otherwise indicated on the Drawings.
- F. Valves with Threaded Connections:
 - 1. Install valves by applying wrench on end of valve nearest the joint to prevent distortion of the valve body.
 - 2. Apply pipe joint compound or Teflon tape on external (male) threads to prevent forcing compound into valve seat area.
- G. Valves with Flanged Connections:
 - 1. Align flanges and gasket carefully before tightening flange bolts.
 - 2. When flanges are aligned, install bolts and hand tighten.
 - 3. Tighten nuts opposite each other with equal tension before moving to next pair of nuts.

4. Valves connected to HDPE shall be retightened after 4 hours.

H. Valves with Wafer Style Connection

1. Wafer style butterfly valves require a spacer before and after the valve to ensure travel of disc is not impeded.
2. Wafer style valves, and spacers if required, shall be centered between the two facing flanges and all bolts installed. Bolts shall be tightened to the manufacturer's recommendations.
3. Wafer style valves installed between one or both flanges being HDPE shall be retightened after 4 hours.
4. Bolts will be of adequate length to allow for three full threads on both ends of the flange.

I. Valves with Lug Style Connectors

1. Lug style butterfly valves require a spacer before and after the valve to ensure travel of disc is not impeded.
2. Bolts will be tightened on one side of the valve first, alternating sides of the flange, prior to installation of the opposite flange.
3. Lug style valves installed between one or both flanges being HDPE shall be retightened after 4 hours.
4. Bolts will be of adequate length to allow the proper seating in the valve body.

END OF SECTION

SECTION 15130– PRESSURE GAUGES

PART 1 - GENERAL

1.1 SUMMARY

This section specifies instruments for pressure measurement and indication, complete with appurtenances, as specified.

1.2 RELATED WORK

- A. The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractor’s responsibility to perform all the work required by the Contract Documents
1. Section 15010 – Mechanical General Provisions
 2. Section 15050 – Piping Systems
 3. Section 15068 – Stainless Steel Pipe and Fittings

1.3 SUBMITTALS

- A. Submit under provisions of Section 01300 – Submittal Procedures. Submit the following:
1. The Contractor shall submit catalog cuts for instruments and accessories to be supplied. Catalog information shall include technical specifications and application information for each piece of equipment. Catalog cuts shall be clearly edited to indicate only those items, model, or series of equipment which are being submitted for approval. All extraneous materials shall be crossed out or otherwise obliterated.
 2. Materials of construction
 3. Complete installation instructions, including calibration
- B. Spare Parts:
1. Provide one (1) additional gauge of each kind of equipment listed in Part 2.
 2. Spare equipment shall be provided in its original packaging and contain copies of installation and operation manuals.
 3. All spare parts shall be provided to, and logged in by, the City’s Representative.

PART 2 - PRODUCTS

2.1 PRESSURE GAUGES

- A. Gauge shall be installed where shown on the drawings

1. In the Side Slope Pump Enclosures for Cell II-1 and II-2:
 - a. Two (2) gauges for each enclosure.
 - b. Pressure range shall be 0 to 30 PSI.

- B. Performance Requirements
 1. The gauges shall be suitable for use under ambient temperature range of 0 to 150°F.
 2. 1.5% accuracy over range of pressure.
 3. The gauge recalibration adjustment shall be accomplished from rear of case without removing internals.

- C. Power Requirements
 1. None

- D. Connection Requirements
 1. Each gauge shall have ½-inch NPT stem connection.
 2. Each gauge shall come be supplied with a stainless steel isolating ball valve
 3. Each gauge shall be isolated with a non-metallic Diaphragm seal, no shock, Type 5, All Non Metallic or equal.

- E. Materials
 1. All gauges shall be 316 Stainless Steel, stem-mounted, glycerin-filled type, with 2.5-inch diameter dial. Each gauge shall have high impact plexiglass and white dial background with black numerals and 0.5 PSI graduations for 30 PSI range and 1 PSI graduations for 60 PSI range.
 2. Each gauge shall have built-in isolating diaphragm
 - a. Diaphragm shall be PVC or Stainless Steel and have Viton or PTFE seals.
 3. Built in snubber for shock protection
 4. Integral diaphragm seal to prevent contact with the pumped liquid.
 5. Valve cock provided to remove air in supply line.

- F. Manufacturers
 1. Kodiak Controls
 2. Approved equal.

PART 3 - EXECUTION

3.1 GENERAL

- A. Equipment specified herein shall be installed as shown on the drawings and shall be in strict accordance with the manufacturer's recommendation.

- B. All gauges shall be supplied by the same manufacturer.

- C. Pressure gauge shall be installed on pipes with a threadolet and a three way isolation ball valve.

3.2 CALIBRATION AND STARTUP

- A. All gauges, and appurtenances shall be pressure tested with the system in which they are installed. At completion of the installation, the equipment shall be adjusted and calibrated for intended service.

END OF SECTION

SECTION 16050 – 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 16, 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. Excavation and backfill required for installation or construction of the WORK of the various sections of Division 16 is included as a part of the WORK under the respective sections, including duct banks, manholes and handholes.

1.2 REFERENCE STANDARDS

- A. The WORK of this Section and all sections in Division 16 shall comply with the following, as applicable:

NEC (NFPA 70)	National Electrical Code
NETA	International Electrical Testing Association
NEMA 250	Enclosure for Electrical Equipment (1000 Volts Maximum)

- B. Electrical equipment shall be listed by and shall bear the label of Underwriters' Laboratories, Inc. (UL).
- 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. 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 COORDINATION REQUIREMENTS

- A. The CONTRACTOR shall coordinate his work with the existing equipment installed in the leachate equipment building. There are several areas where the CONTRACTOR shall connect to or interface with existing equipment provided by the leachate building contractor. They include, but are not limited to:
 1. Connecting the side slope pump motor feeders to the existing starters in the electrical room.
 2. Connecting the side slope pump level transducers to the existing PLC control panel.
 3. Connecting the side slope pump enclosure heat trace and lighting branch circuits to the existing panelboard 'B' in the electrical room.
 4. Connecting the various new underground branch circuits and feeders to the existing underground conduit system.
- B. The CONTRACTOR shall verify the condition, suitability and operation of the existing equipment and notify the ENGINEER of any problems prior to making any connections or modifications.
- C. After all connections to existing equipment are made, the CONTRACTOR shall coordinate with the leachate equipment building systems integrator (Boreal Controls, 907-586-8367) to make the functional operation changes as identified in the functional narrative. The CONTRACTOR shall also coordinate with Boreal Controls to verify proper operation of all equipment in accordance with the modified functional narrative. The CONTRACTOR shall to test and troubleshoot all systems including the slide slope pump level controls and pump operation.

1.5 PERMITS AND INSPECTION

- A. All electrical permits shall be obtained and inspection fees shall be paid by the CONTRACTOR.

1.6 SUBMITTALS

- A. Furnish submittals in accordance with Section 01300 – Product Data Submittals.
- 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 the time specified in Section 01300, 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 Section 01300 – Product Data Submittals.
- 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 Section 01300 – Product Data Submittals.

1.7 AREA DESIGNATIONS

A. General:

1. Raceway system enclosures shall comply with Section 16110 – 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 outdoors shall be NEMA 3R, 4 or 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 3, 4 & 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 16 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 CONSTRUCTION SEQUENCING

- A. 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.
- B. The CONTRACTOR is advised to visit the Site before submitting a Bid to better acquaint himself with the WORK of this Contract. Lack of knowledge will not be accepted as a reason for granting extra compensation to perform the WORK.

- C. Installation of New Equipment:
 - 1. The CONTRACTOR will install and terminate the new wireways, 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.
 - 2. 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 1 year.

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.

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 conduits 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 conduit development drawings, or "home runs," are shown, the CONTRACTOR shall route the conduits in accordance with the indicated installation requirements.
 - 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 conduits 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 1/2-inch minimum. Where circuits are combined in the same raceway, the CONTRACTOR shall de-rate conductor ampacities in accordance with NEC requirements.
- C. 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.
- D. 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.

3.2 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 Section 01300 – Contractor Submittals.
- C. Panels, conduit, and other equipment shall be anchored and supported for Seismic requirements.

3.3 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 outlets connected to each circuit.

3.4 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 scraped 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.

3.5 CONTROL PANEL WIRING

- A. The CONTRACTOR shall ensure all panels are UL-listed upon completion of the WORK.

- END OF SECTION -

SECTION 16110 – 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. An equipment grounding conductor run with or enclosing the circuit conductors. It shall be one or more or a combination of the following:
 - a. A copper, aluminum, or copper-clad aluminum conductor. This conductor shall be solid or stranded; insulated, covered, or bare; and in the form of a wire or a busbar of any shape.

1.2 SUBMITTALS

- A. Submit under provisions of Section 01300 – Product Data Submittals, as follows:
 - 1. Descriptive literature bulletins, and catalog cuts of the equipment.
 - 2. Performance curves.
 - 3. Materials of construction.
 - 4. Complete wiring diagrams.
 - 5. Complete installation instructions, with points of electrical and plumbing connection requirements clearly shown.

PART - 2 PRODUCTS

2.1 GENERAL

- A. Pull and junction boxes, fittings, 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 where shown.
- B. HDPE CONDUIT
1. HDPE conduit shall be smooth wall meeting NEMA TC-7 specifications and shall be UL listed for underground use.
 2. HDPE shall be 2" trade size or larger as manufactured by Carlon or approved equal.
 3. HDPE shall be used in underground locations where indicated.
- 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 not 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. Boxes larger than standard cast or malleable types shall be 304 stainless steel, NEMA 4X.
 4. In outdoor areas, conduit 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.

5. Conduit, fittings, and boxes in hazardous locations shall be suitable for the Class and Division indicated.
- 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. Stainless Steel Boxes
1. Stainless steel boxes shall be used 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 EXPLOSION-PROOF BOXES
- A. Explosion-proof boxes shall be used to house control stations, switches, any arc producing device, and terminal for splicing in explosion-proof areas. 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**, or equal.

2.5 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 and be UL-listed for use in Class 1 Division 1 areas. Fittings shall be **Appleton Electric**, or equal.

2.6 CABLE TRAYS

- A. Cable tray is not to be used.

2.7 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.

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. Factory elbows shall be utilized wherever possible.
- C. Separate raceway systems shall be provided for:
 - 1. Analog signals and 24 VDC discrete signals and instrument power supply conductors
 - 2. 120 VAC and higher wiring
 - 3. Intrinsically safe wiring

When non-loop powered instruments have only one raceway port, the CONTRACTOR may run both the analog and 120VAC 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.

- E. Where raceways are indicated but routing is not shown, such as home runs or on conduit developments and schedules, raceway routings shall be the CONTRACTOR's choice and in strict accordance with the NEC and customary installation practice.
- F. 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.
- G. Support rod attachment for ceiling-hung trapeze installations shall meet the seismic requirements in accordance with Section 13503, Seismic Restraint Requirements for Non-Structural Components.
- H. Exposed raceways shall be installed parallel or perpendicular to structural beams.
- I. Install expansion fittings with bonding jumpers wherever raceways cross building expansion joints.
- J. 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.
- K. In underground facilities or NEMA 4X areas, all conduit penetrations in panels shall be bottom entry.
- L. Wherever contact with concrete or dissimilar metals can produce galvanic corrosion of equipment, suitable insulating means shall be provided to prevent such corrosion.
- M. 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.
- N. The maximum allowable conduit fill for instrumentation and control wiring is given by the following table:

Conduit Diameter	No. of 12-Gauge Wires	No. of 18-Gauge TWS
3/4"	8	2
1"	16	4
1-1/4"	30	7
1-1/2"	42	10

2"	72	17
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Note: No instrumentation or control wiring conduit is to be larger than 2 inches in diameter.

3.2 CONDUIT

- A. Exposed conduit shall be rigid galvanized steel unless indicated otherwise:
- B. Exposed conduit shall be 1/2-inch minimum trade size. Supports shall be installed at distances required by the NEC.
- C. Conduit shall not be encased in the bottom floor slab below grade.
- D. 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.
- E. Conduits passing through a slab, wall, or beam shall not impair significantly the strength of the construction.
- F. Conduits 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. Conduits shall not be spaced closer than 3 outside diameters on centers.
- G. Conduit shall be placed so that cutting, bending, or displacing reinforcement from its proper location will not be required.
- H. Threads shall be coated with a conductive lubricant before assembly.
- I. 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.
- J. Wherever conduit enters substructures below grade, the conduit shall be sloped to drain water away from the structure. Extreme care shall be taken to avoid pockets or depressions in conduit.
- K. Connections to motors and other equipment subject to vibration shall be made with LFMC in non-hazardous locations or explosion-proof flexible couplings in hazardous locations. Flexible connections shall not exceed

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.

- L. Conduit passing through walls or floors shall have plastic sleeves.
- M. Provide conduit seal fittings in hazardous classified locations, in strict accordance with the NEC.
- N. 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.
- O. Empty conduits shall be tagged at both ends to indicate the final destination. Where it is not possible to tag the conduit, 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.

3.3 CABLE TRAYS

- A. Cable tray is not to be used.

- END OF SECTION -

SECTION 16120 – WIRES 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 SUBMITTALS

- A. Submit under provisions of Section 01300 – Product Data Submittals, as follows:
 - 1. Descriptive literature bulletins, and catalog cuts of the equipment.
 - 2. Performance curves.
 - 3. Materials of construction.
 - 4. Complete wiring diagrams.
 - 5. Complete installation instructions, with points of electrical and plumbing connection requirements clearly shown.

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 Electric Code, latest 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 Class B Type THWN wire for interior and Type XHHW-2 for exterior or below grade.
 - 3. 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.

4. 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.
5. 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.12 stranded 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

1. Tray cable is not to be used.

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.

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 shall not be pulled into raceway until raceway has been cleared of moisture and debris.
- B. Pulling tensions on raceway cables shall be within the limits recommended by the cable manufacturer. Wire pulling lubricant, where needed, shall be UL-approved.
- C. The following wiring shall be run in separate raceways:
 - 1. 4-20 mA analog signals and 24 VDC discrete signal and instrument power supply.
 - 2. All AC circuits.
- D. Wire in panels, cabinets, and wireways shall be neatly grouped using nylon tie straps, and shall be fanned out to terminals.

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 unless otherwise shown.
 - 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 control 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 not be spliced unless the CONTRACTOR can convince the ENGINEER that they are essential and the ENGINEER gives written permission.

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 shall be assigned a number that shall be attached to the cable at intermediate pull boxes and at stub-up locations beneath freestanding equipment. It is expected that the cable number shall form a part of the individual wire number. Individual control conductors and instrumentation cable shall be identified at pull points as described above. 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: Phase A - Black, Phase B - Red, Phase C - Blue, and Neutral - White. The 120/240-volt system conductors shall be color-coded as follows: Line 1 - Black, Line 2 - Red, and Neutral - White. The 480/277-volt system conductors shall be color-coded as follows: Phase A - Brown, Phase B - Orange, Phase C - Yellow, and Neutral - Gray. Color-coding tape shall be used where colored insulation is not available. Insulated ground wire shall be Green, and neutral shall be Gray. Color

coding and phasing shall be consistent throughout the Site, but 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.

3. General purpose AC control cables shall be Red. General purpose DC control cables shall be Blue.
4. Spare cable shall be terminated on terminal screws and shall be identified with a unique number as well as with destination.
5. 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 01300 – Product Data 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.
 2. Field testing shall be done after cables are installed in the raceways.
 3. Test results shall be submitted to the ENGINEER for review and acceptance.
 4. Cables with less than 100-megohm insulation resistance 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 –

SECTION 16130 – OUTLET BOXES

PART - 1 GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 16050: Electrical Work, General

1.2 DESCRIPTION

- A. This section describes general requirements, products and methods of execution relating to outlet boxes for use with wiring devices and lighting fixture outlets approved for use on this project. All boxes shall be sized per NEC - Article 370.

1.3 QUALITY ASSURANCE

- A. UL approval for intended usage shall constitute proof of acceptable quality.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01300 – Product Data Submittals, as follows:
 1. Descriptive literature bulletins, and catalog cuts of the equipment.
 2. Performance curves.
 3. Materials of construction.
 4. Complete wiring diagrams.
 5. Complete installation instructions, with points of electrical and plumbing connection requirements clearly shown.

PART - 2 MATERIALS AND EQUIPMENT

2.1 CAST BOXES

- A. Boxes equipped with mounting lugs, threaded hubs and gasketed covers shall be used in the following locations:
 1. All exterior locations;
 2. All wet or damp locations;
 3. Where exposed to mechanical damage;
 4. All exposed interior locations below 48" above floor;
 5. Where shown on Drawings.

2.2 EXPLOSION-PROOF BOXES

- A. In hazardous areas, boxes shall be rated appropriately for the Class and Division of the area in which they are to be installed.

2.3 ACCESSORIES

- A. Box covers, extension rings, bases, hanger bars, etc., for use in connection with the installation, shall be approved for use in the various applications.

PART - 3 EXECUTION

3.1 INSTALLATION

- A. Outlet Boxes shall be securely fastened in position and supported independently of the conduit system.
- B. Boxes shall be installed true to the building lines and at equal heights in conformity with mounting heights specified elsewhere in other Sections of the Specifications.
- C. Provide the best suitable box for each outlet requirement.
- D. Boxes shall have only the holes necessary to accommodate the conduits at point of installation. All boxes shall have lugs or ears to secure covers.
- E. All boxes shall be accessible.

- END OF SECTION -

SECTION 16131 – PULL AND JUNCTION BOXES

PART - 1 GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 16050: Electrical Work, General
- B. Section 16130: Outlet Boxes

1.2 DESCRIPTION

- A. This Section describes general provisions, products and methods of execution relating to pull and junction boxes approved for use on this project. Furnish all such boxes, whether shown or not, in order to conform to requirements for maximum pulling length and maximum number of bends allowed.

1.3 QUALITY ASSURANCE

- A. Pull and junction boxes 150 cubic inches and smaller shall conform to Section 16130.
- B. Pull and junction boxes larger than 150 cubic inches shall conform to Underwriters Laboratory (UL) standard 50-1970, Cabinets and Boxes. The UL label shall constitute proof of acceptable quality.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01300 – Product Data Submittals, as follows:
 - 1. Descriptive literature bulletins, and catalog cuts of the equipment.
 - 2. Performance curves.
 - 3. Materials of construction.
 - 4. Complete wiring diagrams.
 - 5. Complete installation instructions, with points of electrical and plumbing connection requirements clearly shown.

PART - 2 MATERIALS AND EQUIPMENT

2.1 GENERAL

- A. All pull and junction boxes shall conform to Article 370 of the NEC and the following requirements:
 - 1. Boxes exposed to rain or installed in damp or wet locations shall be NEMA 4X, metallic or as noted.
 - 2. Boxes installed underground shall be either precast concrete or cast iron.

3. Special boxes, as noted on the Drawings, shall be installed in areas of specific service and/or hazards.

PART - 3 EXECUTION

3.1 INSTALLATION

- A. All boxes shall be installed so that covers are readily accessible and adequate working clearance is maintained after completion of the installation.

- END OF SECTION -

SECTION 16140 – WIRING DEVICES

PART - 1 GENERAL

1.1 THE REQUIREMENT

- A. The CONTRACTOR shall provide all wiring devices, plates, and nameplates in accordance with the Contract Documents.
- B. The requirements of Section 16050 – 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.

1.1 SUBMITTALS

- A. Submit under provisions of Section 01300 – Product Data Submittals, as follows:
 - 1. Descriptive literature bulletins, and catalog cuts of the equipment.
 - 2. Performance curves.
 - 3. Materials of construction.
 - 4. Complete wiring diagrams.
 - 5. Complete installation instructions, with points of electrical and plumbing connection requirements clearly shown.

PART - 2 PRODUCTS

2.2 GENERAL

- A. All devices shall carry the UL label.
- B. General purpose duplex receptacles and toggle switch handles shall be brown everywhere except in finished rooms where they shall be ivory. Special purpose receptacles shall have a body color as indicated. Receptacles and switches shall conform to Federal Specifications W-C-596E and W-S-896E, respectively.

2.3 LIGHTING SWITCHES

- A. Local branch switches shall be toggle type, rated at 20 amps, 120-277 VAC, and shall be **General Electric Cat. No. GE-5951-1** for single pole, **GE-5953-1** for 3-way and **GE-5954-1** for 4-way, or similar types as manufactured by **Hubbell**, or equal.
- B. Switches in hazardous locations shall be Class 1, Division 1, 120V, 20 amps rated and shall be factory sealed.

2.4 GENERAL PURPOSE RECEPTACLES

- A. Duplex receptacles rated 120-volt, 20 amps shall be polarized 3-wire type for use with 3-wire cord with grounded lead and 1 designated stud shall be permanently grounded to the conduit system (NEMA 5-20R). Duplex 120-volt receptacles shall be **G.E. 5362, Hubbell 5362**, or equal. Single receptacles shall be **G.E. 4102, Hubbell 4102**, or equal.
- B. Ground-fault circuit interrupting receptacles (GFCI's) shall be installed at the locations indicated. GFCI's shall be rated 125-volt, 20 amps and shall be **Hubbell GF-5362**, or equal.

2.5 ENCLOSURES AND COVERS

- A. Surface mounted switches and receptacles shall be in FS or FD type cast device boxes.
- B. In finished areas, switch and receptacle boxes shall be provided with SUPER STAINLESS STEEL COVERS as manufactured by **Harvey Hubbell, Arrow Hart, Bryant**, or equal.
- C. In areas where cast boxes are used, switch and receptacle covers shall be **Crouse-Hinds Catalogue No. DS185 and WLRD-1, or Adalet No. WSL and WRD**, or equal.
- D. Receptacles in exterior locations shall be with s-hinged cover/enclosure marked "Suitable for Wet Locations when in use" and "UL Listed." There shall be a gasket between the enclosure and the mounting surface and between the hinged cover and mounting plate/base. The cover shall be metallic, **TayMac Specification Grade**, or equal.
- E. In hazardous locations, enclosures and covers shall be appropriately rated.

2.6 NAMEPLATES

- A. Provide nameplates or equivalent markings on switch enclosures to indicate ON and OFF positions of each switch. ON and OFF for 3-way or 4-way switches is not acceptable. Provide receptacles for special purposes with nameplates indicating their use. Conform to requirements of Section 16050 – Electrical Work, General.

PART - 3 EXECUTION

3.1 CONNECTION

- A. Securely fasten nameplates using screws, bolts, or rivets centered under or on the device, unless otherwise indicated.

3.2 GROUNDING

- A. Ground all devices, including switches and receptacles, in accordance with NEC, ART 250, and Section 16450 – Grounding.
- B. Ground switches and associated metal plates through switch mounting yoke, outlet box, and raceway system.
- C. Ground flush receptacles and their metal plates through positive ground connections to outlet box and grounding system. Maintain ground to each receptacle by spring-loaded grounding contact to mounting screw or by grounding jumper, each making positive connection to outlet box and grounding system at all times.

3.3 FIELD TESTING

- A. Provide checkout, field, and functional testing of wiring devices in accordance with Section 16950 – Electrical Tests.
- B. Test each receptacle for polarity and ground integrity with a standard receptacle tester.

- END OF SECTION -

SECTION 16150 – MOTORS

PART - 1 GENERAL

1.1 DESCRIPTION OF WORK

- A. The work covered by this section shall include all labor, materials and equipment required to furnish and install the electrical motors as shown on the drawings and as specified.

1.2 RELATED WORK

- A. Division 11 – Equipment
- B. Division 15– Mechanical
- C. Section 16050 – Electrical Work, General

1.3 REFERENCE STANDARDS

- A. All motors, materials and equipment specified herein shall, within the scope of U/L Examination Services, be listed by the Underwriter's Laboratories for the purpose for which they are used. They shall bear the U/L label when required.
- B. All motors, materials and equipment specified herein shall conform to all the latest performance, structural, electrical, testing, materials and other applicable requirements of NEMA, ANSI, IEEE and insofar as possible, with all OSHA and safety regulations.
- C. All motors, materials and equipment specified herein and their installation methods shall conform to the latest published version of the National Electric Code, N.E.C. and state and local codes.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01300 – Product Data Submittals, as follows:
 - 1. Descriptive literature bulletins, and catalog cuts of the equipment.
 - 2. Performance curves.
 - 3. Materials of construction.
 - 4. Complete wiring diagrams.
 - 5. Complete installation instructions, with points of electrical and plumbing connection requirements clearly shown.
 - 6. Complete nameplate data in accordance with NEMA Standards MG1 as well as power factor and efficiency information.
 - 7. Submit the motor manufacturer's certification of conformance to the specified bearing life on all motors.

1.5 QUALITY ASSURANCE

- A. All motors shall conform to the governing NEMA standards and ASA Form C-50 for rotating machinery.

PART - 2 MATERIALS AND EQUIPMENT

2.1 SERVICE CONDITIONS

- A. All equipment shall be designed and built for industrial service and be capable of operating successfully under the following applicable conditions.
1. 40°C. maximum ambient temperature to -20°C minimum ambient temperature.
 2. Voltage variations to ± 10 percent of nameplate rating.
 3. Frequency variations to ± 5 percent of nameplate rating.
 4. Combined voltage and frequency variations to ± 10 percent total, as long as frequency does not exceed ± 5 percent.
 5. 3,300 foot maximum altitude.
 6. Motors for use with variable speed controllers shall be specifically rated for such use.
 7. Minimum power factor at full load and rated voltage shall be greater than or equal to NEMA requirements for high efficiency motors.

2.2 TYPE OF MOTORS

- A. Provide squirrel-cage induction motors unless otherwise noted.
1. Provide motors especially suitable both electrically and mechanically to drive the loads specified. The speed, horsepower, torque, base, bearing, shaft, insulation, and enclosure shall be closely coordinated with equipment requirements specified herein and in other portions of this specification to provide a satisfactory, efficient drive without overloading, overheating, abnormal noise or vibration. The BHP required of the driven equipment under the most severe operating conditions for the equipment served shall not exceed the rated nameplate horsepower of the motor when operating at a service factor not to exceed 1.0. The "most severe operating conditions" shall include the full possible range of normal operating conditions but shall not include unusual conditions such as equipment failure.
 2. Unless otherwise specified, all motors larger than 1/2 HP shall be 3-phase, squirrel-cage induction type, NEMA Design B, connected

and rated for operation on a 480-volt, 60 Hz, alternating current system. Conductors shall be copper. Motor voltage shall be 460 volts unless specified otherwise.

3. Motor voltage shall be stamped on the name plate and relate to the nominal voltage as follows:

3 - Phase Motors

<u>Nominal Volts</u>	<u>Motor ratings</u>
480 volts	460 V.

Single Phase Motors

<u>Nominal Volts</u>	<u>Motor ratings</u>
120 volts	115 V. or 115/230 V.

4. Unless otherwise specified, all motors 1/2 HP and smaller, shall be standard single-phase, capacitor-start, induction type, designed for operation on 115-volt, 60-Hz alternating current system. Conductors shall be copper.

2.3 APPLICATION TYPES

- A. Motors will be identified as follows:
 - Type I: Process Motors
 - Type II: Non-process Motors
- B. Each motor shall be of the type specified in the individual equipment specifications. The requirements for Type I and Type II motors shall be as specified elsewhere in this motor specification.
- C. Unless otherwise noted, Type I or process motors are defined as motors driving process pumps and blowers. A motor may also be a process motor designated in the equipment drive specification.
- D. Unless otherwise noted, Type II or Non-process motors are defined as fractional horsepower single-phase motors.

2.4 ELECTRICAL REQUIREMENTS FOR MOTORS

- A. Energy efficiency: Type I motors shall be of the NEMA defined "Energy Efficient" type and shall meet or exceed the efficiencies of the G.E. "Energy Saver" line of motors. Energy efficient motors shall meet or exceed the published guaranteed minimum efficiency value and the tested efficiency shall be in accordance with IEEE Standard 112, test method B.

- B. Type II motors shall be standard efficiency as defined by IEEE.
- C. Service factor for 3-phase motors shall be 1.15. Service factor for single-phase motors shall be as specified in NEMA MG1-12.47. Motors not having service factors shall be sized such that they do not exceed 85 percent of full load amperage at any point on the operating curve of the driven device.
- D. Time rating: Unless otherwise specified, all motors shall have continuous time ratings.
- E. Torques: Motors shall meet, or exceed, the locked rotor (starting) and breakdown (maximum) torques specified in NEMA Standards for the NEMA design and rating specified.
- F. Locked rotor starting KVA shall not exceed NEMA Code F for motors rated 15 HP and larger.
- G. Protection: Current density and heating characteristics shall be such that the motors will not burn out if subjected to a maximum of a 20 second stall at 6 times full load current.
- H. Temperature rise: The allowable temperature rise as measured by resistance when operating at a 1.0 service factor load shall conform to the limiting observable temperatures in NEMA-MG1, latest revision for Class B insulation.

2.5 NAMEPLATES

- A. Motor nameplates for Type I motors shall be stainless steel. Nameplates for Type II motors shall be of a noncorrosive metal that is not discolored by hydrogen sulfide. Nameplates shall be engraved or stamped and shall be fastened to the motor frame with screws or drive pins of the same material. Nameplates shall indicate clearly all the items of information enumerated in NEMA Standard MG1.
- B. The Contractor shall coordinate the motor nameplate location so it is readily visible for inspection in the completed machine.
- C. Mount nameplate for submersible motors inside starter door.

2.6 ELECTRICAL REQUIREMENTS FOR 3-PHASE MOTORS

- A. Rating: Motors shall not be required to operate at greater than their nameplate horsepower. Use of the service factor will not be allowed.
- B. Insulation: Unless otherwise specified, motors shall have Class F insulation and be rated on a class B temperature rise with additional nonhygroscopic moisture protection which will maintain a minimum resistance of 1.0 megohms after 168 hours of exposure at 100% humidity.

- C. Class B insulating materials shall not be utilized except in single-phase fractional horsepower Type II motors for use in dry locations, with a standard reduction in rated temperature rise.
 - 1. Where nonhygroscopic is specified, provide an insulation system which is nonhygroscopic.
 - 2. Where encapsulation is specified, provide insulation resin encapsulation by a molded or equivalent process in which the resin completely surrounds the conductors in the slots and end turns, leaving no voids between the conductors or adjacent stator steel.

2.7 MECHANICAL REQUIREMENTS FOR 3-PHASE MOTORS

- A. Frame sizes: Frames shall conform to latest NEMA Standard MG1 for "T" frames, and all dimensions shall meet NEMA Standards insofar as they apply.
- B. Enclosure for Type I motors, unless otherwise specified, shall be totally enclosed fan cooled. Enclosures for Type II motors shall be drip-proof unless otherwise specified.
- C. Enclosures for motors in hazardous locations shall be rated for the appropriate Class and Division.
- D. Enclosures shall include, but not be limited to, the following environmentally protected types as defined in NEMA MG1.
 - 1. Drip-proof.
 - 2. Totally enclosed fan-cooled (TEFC).
 - 3. Totally enclosed non-ventilated (TENV).
 - 4. Drip-proof weather-protected Type I.
- E. Totally enclosed motors shall be provided with drilled and tapped holes to drain all cavities within the motor. Motors with frames 286T or smaller shall have corrosion-resistant plugs in the drain holes. Motors with frame 324T or larger shall be provided with automatic breather-drain devices. TENV motors may be substituted for TEFC where recommended by the equipment manufacturer.
- F. Submersible motors shall conform to the equipment specifications.
- G. Shafts shall be in accordance with NEMA "T" or "TS" dimensions. Long shafts shall be suitable for belt, chain, or gear drive, within limits established by good industrial practice and documented by NEMA Standards MG-1-14.42 and MG1-14.07. Short shafts shall be used for direct connection. Vertical motors shall be the solid- shaft type except where applications require a hollow shaft design.
- H. Bearing and Lubrication: All bearings shall be anti-friction type AFBMA standard sizes. Bearings shall be selected to provide L10 rating life of

17,500 hours minimum for belted applications, 100,000 hours minimum for flexible direct-coupled applications. All motors shall have thrust ratings not less than the combined static and dynamic loads to be imposed. The bearing house shall be large enough to hold sufficient lubricant to minimize the need for frequent re-lubrication; but facilities shall be provided for adding new grease and draining out old grease without major motor disassembly. The bearing housing shall have long, tight, running fits or rotating shields to protect against the entrance of foreign matter into the bearings, or leakage of grease out of bearing cavity.

- I. Submit upon the Engineer's request, certification of bearing life on motors where application conditions suggest significant belt drive or thrust loads.
- J. Balance and vibration:
 - 1. The vibration in any direction, as measured at the bearing housings, when tested in accordance with the latest NEMA Standard MG1, shall be within the limits established as follows:

SPEED	MAXIMUM AMPLITUDE (INCHES)
3000 TO 4000	0.001
1500 TO 2999	0.0015
1000 TO 1499	0.002
999 TO BELOW	0.0025

- 2. If balance weights are added to the rotor, they shall be permanently secured by welding, peening, or other approved methods.
- K. Materials: Stator frames may be cast iron, or cast or extruded aluminum. End shields may be cast iron or cast aluminum. Conduit boxes on Type I motors shall be cast iron or cast aluminum. (See also Conduit Boxes, Paragraph G.)
- L. Conduit boxes for Type I motors shall be split from top to bottom and shall be arranged for rotation so conduit can be brought in from top, bottom or either side. Conduit boxes for Type I motors shall be tapped for threaded conduit connection. Conduit hole size shall conform to minimum "AA" dimension, NEMA standard MG1 depending on motor rating or shall conform to electrical drawings.
- M. Lifting lugs: Provide built in lifting lugs or drilling, taping and lifting eye bolts on all motors weighing more than 83 pounds.
- N. Motor leads into conduit box shall have the same insulation class as the winding. Leads shall be marked throughout the entire length to provide

identification after terminals are taped or clipped. Leads insulated with glass braid shall be furnished with a metal marker on the lead.

- O. Shaft seals: All Type I motors shall have a rotating seal or slinger located on the shaft at the drive-end shield opening to protect the bearing cavity from moisture and other foreign material.
- P. Connection diagrams shall be permanently attached to the motor, either inside the conduit box or on the motor frame in a location readable from the conduit box side.
- Q. External finish: All motors shall be primed and painted with a durable machine enamel, manufacturer's standard color, in accordance with Specification 09910.
- R. Hardware: All bolts, screws and other external hardware shall be treated for resistance to corrosion.
- S. Sound levels shall be in accordance with NEMA Standard MG1.

2.8 ACCEPTABLE MOTORS

- A. The following 3-phase motors listed by type and enclosure are acceptable, provided they otherwise meet the requirements of this motor specification.
 - 1. Type I - Process motors
 - a. TEFC - General Electric, Custom Severe Duty, Type KS, Class F Insulation; Westinghouse MAC Standard Life-Line "T"; or equal.
 - b. Weather-Protected NEMA Type I - TEFC as specified above.
 - 2. Type II - Non-process motors
 - a. TEFC - General Electric custom Type K; Westinghouse Standard Life-Line "T"; or equal.

PART - 3 EXECUTION

3.1 TESTS

- A. Each polyphase motor shall be given a routine test to determine that it is free from electrical or mechanical defects and provide assurance that it meets the specifications. The routine test shall conform to applicable NEMA and IEEE standards latest revision and shall be as generally defined as "Standard Commercial Test". Copies of the test report will not be required unless actual operation after installation suggests the motor's performance should be verified, in which case certified copies of the test report shall be submitted upon the Engineer's request.

3.2 PREPARATION FOR SHIPMENT

- A. Protective coating: Before shipment, the shaft extension and any other external bare exposed metal parts of each motor shall be coated with an easily removable rust preventative.
- B. Packaging: All motors shall be packed in Styrofoam or securely fastened to a hardwood skid or pallet for fork truck handling and shall be covered for protection against dirt and moisture during transit and for outdoor storage.

- END OF SECTION -

SECTION 16180 – OVERCURRENT PROTECTIVE DEVICES

PART - 1 GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 16050: Electrical Work, General
- B. Section 16164: Panelboards

1.2 DESCRIPTION

- A. This Section describes general requirements, products, and methods of execution relating to overcurrent protective devices approved for use on this project. Type, duty rating and characteristics, fault interrupting capability and coordination requirements shall be determined from the plans and the following Specifications.

1.3 QUALITY ASSURANCE

- A. Devices shall be the latest approved design as manufactured by a nationally recognized manufacturer and in conformity with applicable standards and UL listed.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01300 – Product Data Submittals, as follows:
 - 1. Descriptive literature bulletins, and catalog cuts of the equipment.
 - 2. Performance curves.
 - 3. Materials of construction.
 - 4. Complete wiring diagrams.
 - 5. Complete installation instructions, with points of electrical and plumbing connection requirements clearly shown.

PART - 2 MATERIALS AND EQUIPMENT

2.1 MOLDED CASE CIRCUIT BREAKERS

- A. Molded case circuit breakers shall be suitable for individual as well as panelboard mounting. Bolt-on type shall be provided, unless "plug-on" type specifically allowed.
- B. The breakers shall meet NEMA and/or UL specifications as applicable to frame and size, standard rating and interrupting capability. Breakers installed in panelboards shall have short circuit interrupt ratings that match those of the panelboard.

- C. The breakers shall be one-, two-, or three-pole as scheduled, operate manually for normal ON-OFF switching and automatically under overload and short circuit conditions.
- D. Operating handle shall open and close all poles simultaneously on a multi-pole breaker. Operating mechanism shall be trip-free so that contacts cannot be held closed against abnormal overcurrent or short circuit condition.

2.2 FUSIBLE SWITCHES

- A. Fusible switches shall be designed for individual or for panelboard mounting.
- B. Switches designed for panel mounting shall have the same properties as specified for the individually mounted switches.
- C. Switches shall conform to NEMA and UL 67 standard.
- D. Switches shall be used in conjunction with fuses as specified in the following in order to constitute a complete "Overcurrent Protective Device".

2.3 FUSES

- A. Fuses of the sizes and types specified on the Drawings shall be installed. Fuses shall be capable of interrupting the prospective symmetrical fault current. Furnish one complete set of spare fuses of each rating installed to the Owner. Provide fuse puller(s) for fuse sizes used.

PART - 3 EXECUTION

3.1 INSTALLATION

- A. Size devices as required by the load being served or as shown on the drawings.

- END OF SECTION -

SECTION 16190 – SUPPORTING DEVICES

PART - 1 GENERAL

1.1 DESCRIPTION

- A. Related Work Specified Elsewhere.
 - 1. Section 16110: Electrical Raceway Systems.
 - 2. Section 16130: Outlet Boxes.
- B. Description of System.
 - 1. Support and align raceways, cabinets, boxes, fixtures, etc., in an approved manner and as specified.

1.2 SUBMITTALS

- A. Submit under provisions of Section 01300 – Product Data Submittals, as follows:
 - 1. Descriptive literature bulletins, and catalog cuts of the equipment.
 - 2. Performance curves.
 - 3. Materials of construction.
 - 4. Complete wiring diagrams.
 - 5. Complete installation instructions, with points of electrical and plumbing connection requirements clearly shown.

PART - 2 MATERIALS AND EQUIPMENT

2.1 MATERIAL

- A. Support raceways and enclosures on approved types of wall brackets, ceiling trapeze hangers, or malleable iron straps.
 - 1. "Kindorf", "Unistrut", or equal.
 - 2. Plumbers perforated strap not permitted as means of support.
 - 3. Stainless steel supports and hardware in wet locations.
 - 4. Galvanized steel support in damp locations.
 - 5. Provide end caps on all exposed corners and edges of supports and fittings.
- B. Material: Cold-formed steel, with corrosion-resistant coating.
- C. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel.

- D. Slotted-Steel Channel Supports: Flange edges turned toward web, and 9/16-inch- (14-mm-) diameter slotted holes at a maximum of 2 inches (50 mm) o.c., in webs.
 - 1. Channel Thickness: Selected to suit structural loading.
 - 2. Fittings and Accessories: Products of the same manufacturer as channel supports.
- E. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers and wall brackets.
- F. Expansion Anchors: Carbon-steel wedge or sleeve type.
- G. Toggle Bolts: All-steel springhead type.
- H. Powder-Driven Threaded Studs: Heat-treated steel.
- I. Earthquake Anchorages.
 - 1. Anchor equipment weighing more than 100 pounds to the building structure to resist lateral earthquake forces.
 - 2. Total lateral (earthquake) force shall be 1.00 times the equipment weight acting laterally in any direction through the equipment center of gravity. Provide adequate backing at structural attachment points to accept the forces involved.
 - 3. Provide equipment supported by flexible isolation mounts with earthquake restraining supports positioned as close to equipment as possible without contact in normal operation (earthquake bumpers). The maximum lateral displacement due to the computed earthquake force from above shall not exceed 1.5 inches. Floor mounted equipment weighing less than 2000 pounds may have one 6 x 6 x 3/8 x 18 inch steel angle bolted to the floor with four 5/8 inch diameter bolts placed on each of four sides of the equipment.

PART - 3 EXECUTION

3.1 INSTALLATION

- A. Pipe straps and hanger rods shall be fastened to concrete by means of inserts, expansion bolts, or powder-driven fasteners, and to hollow masonry by means of toggle bolts.
- B. Cable trays, multi-conduit runs, etc., shall be supported by double rods at each point of support and be supported independently of any other building system.
- C. Secure boxes, wall brackets, cabinets, and hangers by means of toggle bolts in gypboard and masonry CMU and wood screws in wood construction. Obtain permission before using any type of powder-powered studs.

- D. Support luminaires from structural members capable of supporting total weight, and independently from wiring system. Attach to gypsum board by approved toggle bolts (minimum of one bolt for each two (2) square feet of fixture or fraction thereof).

- END OF SECTION -

SECTION 16450 – 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 16050 – 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 SUBMITTALS

- A. Submit under provisions of Section 01300 – Product Data Submittals, as follows:
 - 1. Descriptive literature bulletins, and catalog cuts of the equipment.
 - 2. Performance curves.
 - 3. Materials of construction.
 - 4. Complete wiring diagrams.
 - 5. Complete installation instructions, with points of electrical and plumbing connection requirements clearly shown.
 - 6. 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. 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 metallurgically 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.
- B. Buried cable-to-cable and cable-to-ground rod connections shall be made using exothermic welds by **Cadweld, Enrico Products**, or equal.
- C. 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.
- D. Grounding clamps shall be used to bond each separately derived system to the grounding electrode conductors.
- E. 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.
- F. Manufacturers of grounding materials shall be **Copperweld, Blackburn, Burndy**, or equal.

PART - 3 EXECUTION

3.1 GROUNDING

- A. Provide a separate 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. 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.
- J. 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.
- K. 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 #12 AWG conductor to the main ground bus for the panel.

- END OF SECTION -

SECTION 16950 – 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 16050 – 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. Demonstrate mechanical and/or electrical interlocking by attempting to subvert the intended sequence.
 - 3. 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.
 - 4. Cable Testing: 480-volt circuits shall be tested for insulation resistance with a 1000-volt megohm meter. Testing shall be done after the 480-volt equipment is terminated. Control and signal wires shall be tested for continuity and resistance to ground.
 - 5. Test Ground Fault Interrupter (GFI) receptacles and circuit breakers for proper operation by methods sanctioned by the receptacle manufacturer.
 - 6. 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. 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.

- 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, etc.
- D. Subsystems shall be defined as individual and groups of pumps, conveyor systems, chemical feeders, air conditioning units, ventilation fans, air compressors, etc.
- E. General: Carry out tests indicated herein for individual items of materials and equipment in other Sections.

PART - 2 PRODUCTS (Not Used)

PART - 3 EXECUTION (Not Used)

- END OF SECTION -

SECTION 16999 – HEAT TRACE

PART - 1 GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 16050: Electrical Work, General
- B. Section 16120: Wire and Cable
- C. Section 16131: Pull and Junction Boxes

1.2 DESCRIPTION

- A. This section describes general requirements, products and methods of execution relating to heat trace approved for use on this project. All heat trace shall be installed per NEC - Articles 426 and 427.

1.3 QUALITY ASSURANCE

- A. UL or FM approval for intended usage shall constitute proof of acceptable quality.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01300 – Product Data Submittals, as follows:
 - 1. Descriptive literature bulletins, and catalog cuts of the equipment.
 - 2. Performance curves.
 - 3. Materials of construction.
 - 4. Complete wiring diagrams.
 - 5. Complete installation instructions, with points of electrical and plumbing connection requirements clearly shown.

PART - 2 MATERIALS AND EQUIPMENT

2.1 PIPE HEAT TRACE – SELF LIMITING

- A. Provide heat trace with ratings per the Plans
- B. Heat trace shall be listed for installation within Class 1, Division 1 hazardous locations.
- C. Construction:
 - 1. 16 AWG copper bus
 - 2. Self-regulating heat core
 - 3. Fluoropolymer jacket bonded to core
 - 4. Tinned copper metal braid over the fluoropolymer jacket

- 5. Fluoropolymer outer jacket.
- D. Manufacturer: Nelson, Raychem, Thermon, or other approved manufacturer.

2.2 ACCESSORIES

- A. Heat trace power connection kits, end kits, ambient temperature thermostats and accessories shall all be from the same manufacturer as the heat trace and shall be listed for its intended purpose.

PART - 3 EXECUTION

3.1 COORDINATION

- A. Coordinate with other trades prior to starting work

3.2 INSTALLATION

- A. Bending Radius:
 - 1. Self-regulating: six times cable diameter or as directed by the manufacturer.
- B. Perform continuity and insulation resistance ('megger') test on all heat trace cables prior to installation in accordance with the manufacturer's instructions. Megger tests shall be performed between the bus wires and the braid. The cable shall be rejected and not installed if it fails the continuity test or if the resistance measured is less than 1,000 megohms. Submit a typed copy of the test results with each cable clearly and uniquely identified by its intended installation location. This is necessary so that its measured value can be compared with test results after installation and after future maintenance and troubleshooting tests.
- C. Heat trace installation shall be in accordance with Article 427 of the NEC and the manufacturer's instructions.
- D. All heat trace splices, end and power connections shall be installed as shown and per the manufacturer's recommendations and shall be accessible above grade. No below grade splices, end or power connections are allowed.
- E. After installation, perform a continuity test on each heat trace cable. Replace any cable that fails this test.
- F. After installation perform an insulation resistance ('megger') test on all heat trace cables in accordance with the manufacturer's instructions. Megger tests shall be performed between the bus wires and the braid, and between the braid and ground if the cable has a jacket over the braid. The cable shall be rejected and replaced if any resistance measured is less than 1,000 megohms. Submit a typed copy of the test results with each cable clearly and uniquely identified by its installation location.

- G. After installation perform a power test on each heat trace cable. Energize each cable and after 10 minutes record the voltage, current and total length of each cable. Submit a typed of the test results.
- H. Test the operation of the ground fault interrupting device on each heat trace circuit. Replace any device that does not operate properly.

- END OF SECTION -

**SECTION 17100 – PROCESS CONTROL AND INSTRUMENTATION
SYSTEMS**

PART - 1 GENERAL

1.1 THE REQUIREMENT

- A. The CONTRACTOR shall provide all Process Control and Instrumentation Systems (PCIS) complete and operable, in accordance with the Contract Documents. All programming and configuration shall be done to provide the functional requirements as specified.
- 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 a System Integrator 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 existing instrumentation and control devices. The CONTRACTOR shall use Boreal Controls (907-586-8367) as the System Integrator since they have already provided the PLC control panel, software and Human Machine Interface (HMI) panel in the leachate building for control of the landfill cell equipment.
 - 2. Due to the complexities associated with the interfacing of numerous control system devices, it is the intent of these Specifications that the System Integrator 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 System Integrator 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 System Integrator responsibilities in addition to the list above are at the discretion of the CONTRACTOR and the System Integrator. Additional requirements in this Section and throughout Division 17 which are stated to be the CONTRACTOR's responsibility may be performed by the System Integrator if the CONTRACTOR and System Integrator so agree.
- D. Control System Panel Designer and Fabricator
1. Control System Panel Designer and Fabricator (CSPDF): Any changes to the existing control system panel, and all other panels that have PLC hardware or communication hardware within them, shall be fabricated by Boreal Controls, 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. Field test any panel changes.
 - c. Program the controller and provide program documentation.
 - d. Any control panel changes shall be done in accordance with UL standard 508A. The UL listing of the panel shall maintained after any changes have been made. The CONTRACTOR shall pay for any field re-listing that may be required.

1.2 SUBMITTALS

- A. Submit under provisions of Section 01300 – Product Data Submittals, as follows:
1. Descriptive literature bulletins, and catalog cuts of the equipment.
 2. Performance curves.
 3. Materials of construction.
 4. Complete wiring diagrams.
 5. Complete installation instructions, with points of electrical and plumbing connection requirements clearly shown.
 6. All equipment tags used in the submittals, O&M manuals, and field identification shall be the complete tag and shall consist of the the instrument tag shown on the drawings.
 7. 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.
 8. 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.

9. 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 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 Drawings.

B. Shop Drawings

1. General

- a. Shop Drawings shall include the letterhead or title block of the System Integrator. The title block shall include, as a minimum, the System Integrator'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 Section 01300 – Product Data Submittals.
- 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 control 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 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 Functional 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 an Instrument Equipment Summary Form 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.

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 Section 01300 – Product Data Submittals. 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 - landfill leachate pumping facility
 - 2. Indoor Temperature Range - 32 through 84 degrees F
 - 3. Relative Humidity - 20 through 90 percent, non-condensing

4. Seismic Zone 4
5. Class 1, Division 1 & 2 hazardous locations.

2.3 SPARE PARTS AND SPECIAL TOOLS

- A. 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.
- B. Special tools and spare parts shall be submitted before startup commences, suitably wrapped and identified.

2.4 SEISMIC ZONE

- A. Panels, instruments, conduits, and pipes shall be anchored to meet seismic restraint requirements.

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 17 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. Where job conditions require reasonable changes in approximated locations and arrangements, or when the OWNER exercises the right to require changes in location of equipment which do not impact material quantities or cause material rework, the CONTRACTOR shall make such changes without additional cost to the OWNER.

B. Conduit, Cables, and Field Wiring

1. Conduit shall be provided under Division 16.
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 16.
3. PLC equipment cables, data highway communication networks shall be provided under Division 17.
4. Terminations and wire identification at PCIS equipment furnished under this or any other Division shall be provided under Division 17.

C. Instrumentation Tie-Downs: Instruments, control panels, and equipment shall be anchored by methods that comply with seismic requirements applicable to the Site.

D. 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.

- E. 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 15015 – 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. Mounting stands and bracket materials and workmanship shall comply with requirements of the Contract Documents.
 11. 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.
 12. The OWNER will not be responsible for any additional cost of rework attributable to actions of the CONTRACTOR or the System Integrator.

3.3 CALIBRATION

- A. General: Devices provided under Division 17 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 insure 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 System Integrator 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 System Integrator 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 System Integrator:
 - 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 System Integrator 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 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.

3.6 REQUIREMENTS FOR SUBSTANTIAL COMPLETION

- A. For the purpose of this Section, the following conditions 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 -

Part 5
DRAWING LIST

Part 5

DRAWING LIST

SHEET NO.	DRAWING TITLE
G-1	TITLE SHEET, LOCATION AND VICINITY MAPS, AND SHEET INDEX
G-2	ABBREVIATIONS, LEGEND AND GENERAL NOTES
G-3	SURVEY CONTROL SHEET
G-4	SITE PLAN
	SCHEDULE A
C-101	CONSTRUCTION LIMITS
C-102	DEMOLITION PLAN
C-201	EXISTING CONDITIONS PLAN
C-202	LINER FOUNDATION GRADING PLAN
C-203	FINISHED FLOOR GRADING PLAN
C-204	CELL II-1 SECTION
C-205	CELL II-1 AND II-2 SECTIONS
C-206	COORDINATE TABLES
C-207	LINER SYSTEM PLAN
C-208	LINER SYSTEM SECTIONS
C-209	MONITORING WELLS CONSTRUCTION PLAN AND DETAILS
C-210	FENCING PLAN
C-211	FENCE DETAILS
C-221	LANDFILL CELL LEACHATE COLLECTION PIPING PLAN
C-222	LANDFILL CELL PIPING PROFILE AND DETAILS
C-223	LEACHATE PIPING DETAILS
C-230	STOCKPILE FILL PLAN
C-231	STOCKPILE FILL SECTION
S-201	PUMP RISER ENCLOSURE PLANS AND SECTIONS
M-201	LEACHATE COLLECTION PUMP PLANS
M-202	LEACHATE COLLECTION PUMP RISER SECTIONS AND DETAILS
M-203	LEACHATE COLLECTION PUMP RISER ENCLOSURE PLANS AND SECTIONS
E101	LEGEND AND ABBREVIATIONS
E102	ELECTRICAL SITE PLAN
E103	POWER ONE-LINE AND MCC ELEVATION
E104	ELECTRICAL FLOOR PLAN
E105	INSTRUMENTATION PLAN
E106	LIGHTING PLAN
E107	PANEL SCHEDULE
E108	HAZARD LOCATION PLAN
E109	SIDE SLOPE PUMP ENCLOSURE ELECTRICAL DETAILS
E110	ELECTRICAL DETAILS
E111	CONTROL PANEL LAYOUT AND FUNCTIONAL NARRATIVE – NIC (FOR REFERENCE ONLY)
E112	CONTROL PANEL BLOCK DIAGRAM – NIC (FOR REFERENCE ONLY)
E113	CONTROL PANEL DISCRETE INPUTS – NIC (FOR REFERENCE ONLY)

SHEET NO.

DRAWING TITLE

E114	CONTROL PANEL DISCRETE OUTPUTS – NIC (FOR REFERENCE ONLY)
E115	CONTROL PANEL ANALOG INPUTS – NIC (FOR REFERENCE ONLY)
E116	CONTROL PANEL ANALOG INPUTS – NIC (FOR REFERENCE ONLY)
E117	CONTROL PANEL ANALOG OUTPUTS – NIC (FOR REFERENCE ONLY)

Part 6

APPENDIX

- A. “Geotechnical Report – Proposed Leachate Tanks at the Unalaska Landfill”, April 10, 2012, by Golder Associates
- B. Minimum Rates of Pay
Pamphlet 600, Issue 28, Effective April 1, 2014
- C. Attachment 6 – “Wage Rate Requirements under FY2010 Appropriations”
- D. ADEC Standard “Monitoring Well Guidance,” September 2013
- E. Department of the Army, Regulatory Division – Permit No. POA-1993-866-M2, Illuliuk Bay. This permit covers filling at the Unalaska Phase II Landfill Area.
- F. Overview, goals, necessary reporting forms, and requirements for compliance with the DBE and EEO Programs
 - DBE Program Overview
 - EEO and DBE Acknowledgements, Goals, and Forms for Compliance Requirements
- G. Alaska Department of Labor (ADOL) – Section of Labor Standards and Safety Division Mechanical Inspection (February 2012) covering “Licensed Powderman” requirements

APPENDIX A

Geotechnical Report

“Geotechnical Report – Proposed Leachate Tanks at the Unalaska Landfill”, April 10, 2012, by Golder Associates



REPORT

GEOTECHNICAL REPORT

Proposed Leachate Tanks at the Unalaska Landfill

Submitted To: Bristol Environmental and Engineering Services Corporation
111 W. 16th Avenue
Third Floor
Anchorage, AK 99501

Submitted By: Golder Associates Inc.
18300 NE Union Hill Road, Suite 200
Redmond, WA 98052 USA

April 10, 2012

Project No. 093-93387.300

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1.0 BACKGROUND

This report presents the results of our subsurface geotechnical investigation and geotechnical design recommendations for the proposed leachate storage tank at the Unalaska Landfill. The landfill is located near Unalaska, Alaska in the Aleutian Islands (Figure 1).

1.1 Project Description

We understand that the proposed construction consists of one leachate storage tank, which will be on the order of 90 feet in diameter and store approximately 40 vertical feet of leachate. The tank will be constructed at the existing landfill. Three locations have been identified as possible sites for the tank. The preferred location is northwest of the existing baler facility and the two alternate locations southeast of the baler facility (Figure 2). We will refer to the alternate locations as one location due to the close proximity of the two.

1.1.1 Brief Site History

Mr. Archie Stepp, owner of the general contracting firm Northern Mechanical Contractors, provided some historic background on the project area (Stepp 2010). The area had been used as a gravel pit / dredging area by the military, extracting beach gravel. Subsequently the military used the area as a dump. West of the existing Summer Bay road, bedrock was not encountered while using a track hoe with a 24-foot reach. Mr. Stepp excavated the area of the Alternate Tanks site (around borehole G10-BH02) as borrow material for the present bailer facility and the excavated “unusable” material from the baler facility was replaced in G10-BH02 area. Mr. Bob Miner, city supervisor of the bailer facility, indicated that artificial fill north of test pit G10-TP06, including concrete blocks ½ cubic yard and larger, resulted from powerhouse construction (Miner 2010). During the field investigation, Kiewit Corporation used this area as a laydown area for equipment.

1.1.2 Surface Conditions

The preferred tank location straddles an existing northwest-trending drainage ditch that forms the southern boundary of the laydown area (Figure C-2, Appendix C). Water from the east side of Summer Bay Road flows through a culvert under the road to the ditch. The drainage ditch flows into the northeast-trending pond that forms the western margin of the laydown area. Shot rock is also stockpiled along the western margin of the laydown area. The laydown area is relatively level and is trafficable by pickup truck.

The alternate tank location is located in a gated area used for the burn pit, construction equipment storage; gravel stockpiles, used appliance and car storage area, and start of the access road to the land fill cells. In addition, there is a lift station to the north. The area is relatively level and passable by passenger vehicles.



1.2 Scope of Services

Our scope of services for this report was contained in our revised proposal dated February 17, 2010. A summary of the scope items includes the following:

- Field investigation – advanced 6 soil borings and excavated 6 test pits
- Laboratory testing – 62 moisture contents, 4 Atterberg Limits, and 13 grain-size analyses
- Engineering analysis – results and recommendations presented in this report
 - Site and project description
 - Site plan with exploration locations
 - Surface soil and water conditions
 - Subsurface soil and water conditions
 - Suitability of on-site materials for use as structural fill
 - Recommendations for imported fill materials
 - Liquefaction potential
 - Seismic stability analysis with respect to lateral spreading
 - Foundation design recommendations



2.0 PROJECT SETTING

2.1 Regional

The project site is located on Unalaska Island, part of the Aleutian volcanic island chain formed by the northward subduction of the Pacific oceanic plate beneath the Kula oceanic plate of the Bering Sea (Connor and O’Haire 1988). The Aleutian subduction zone is one of the most seismically active regions in the world, with Unalaska Island being adjacent to the 1957 Magnitude 8.7 earthquake rupture zone (Haeussler and Plafker 2003). Bedrock on the island consists of granodiorite batholiths/plutons; basalt, andesite, and pyroclastic rocks; intrusive sills and dikes of basalt and andesite; volcanic sedimentary rocks. Unconsolidated surficial deposits consist of alluvial, beach, eolian, and glacial origins (Drewes et al. 1961). The area was covered by glaciers during the late Pleistocene (Coulter et al. 1965). Unalaska Island is identified as an area generally free of permafrost (Ferrians 1965).

2.2 Local

The project site is located along the southeastern coast of Iliuliuk Bay, at the base of the northwest-facing slopes of Mt. Newhall, on a low-angle alluvial or colluvial fan (Bristol 2006). Bedrock exposed in the steep slopes appears to be green, fine- to medium-grain volcanic sandstone. The steep, vegetated slopes are mantled by brown overburden, interpreted as volcanic ash, and the slopes are incised with numerous stream channels. Overburden and bedrock are exposed through erosion and mass movement. Reeder (1986) has identified a bedrock landslide zone in the northern portion of the alluvial fan-delta region, estimated as Holocene or slightly older in age. The majority of the project area is covered by artificial fill and landfill cells. Along the shoreline, subrounded beach cobbles and gravel were observed, with bedrock along the coastline further northeast of the project site exposed at low tides.

2.3 Climate

Unalaska and Dutch Harbor are in the Maritime Climatic Zone of Alaska, with heavy precipitation, cool summers, and moderate winters. The weather is usually characterized by wind, rain, fog, and overcast skies, with mean daily temperature ranging from 28°F to 39°F in winter and 45°F to 55°F in summer. Monthly mean temperatures, from the last three decades of the last century, are shown in Table 2-1. Temperature extremes range from -9°F to 79°F.

Table 2-1: Monthly Mean Temperatures

	MEAN TEMPERATURES (°Fahrenheit) 1971 – 2000												
Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Dutch Harbor	31.5	31.2	32.7	35.4	40.7	45.8	50.9	52.5	48.2	42.0	37.1	33.5	40.1

Source: NOAA 2002





Most of the precipitation falls as snow during the winter and as drizzle at other times. Annual precipitation averages about 60 inches, including more than 86 inches of snow Western Regional Climate Center. (WRCC- 2000). The precipitation exceeds 0.01 in. on an average of 221 days per year.

Fog is most common during the summer, and gales and williwaws (local, very strong, gusty winds) are most frequent during the fall and early winter. The prevailing wind direction is south and southeast. The highest recorded wind velocity was in December 1988 at 172 miles per hour (Unalaska/Dutch Harbor Chamber of Commerce 1992).

2.3.1 Season Ground Frost

Thermal analyses indicate that the design frost depth is in the range of 1.4 to 2.8 feet. However, this analysis is highly dependent upon snow accumulation, which is difficult to pinpoint given the intermittency of snow throughout the winter. Numerous freeze/thaw cycles are common throughout the winter, along with precipitation consisting of a mixture of rain and snow. This analysis is based on a design annual freezing index of 830 °F-days, which is within the 90 percentile design freezing index for Cold Bay Airport. The analysis was performed using the computer program ModBerg developed by the U.S. Army Cold Regions Research and Engineering Laboratory. Based on discussions with City of Unalaska staff, frost depth is commonly 1 foot, and during colder winters, can reach 2 feet. This estimated frost depth does not account for any heat contribution from fluid in the tank, which is unknown, but expected to reduce frost penetration near the footing.



3.0 SUBSURFACE INVESTIGATION

3.1 Drilling Program

The subsurface investigation consisted of the following explorations, with locations of test holes and test pits shown in Figure 2:

- Two boreholes G10-BH01 and G10-BH02 were drilled near the proposed tank centers.
 - Completed by water rotary methods to 92-foot and 35.7-foot depths, respectively.
 - The upper 9 to 10 feet of soil was pre-excavated before drilling in order to remove oversized shot rock and to log subsurface conditions. Excavated material was replaced with processed crushed borrow.
- Four boreholes G10-BH03 to G10-BH06 were drilled along the tank perimeters.
 - Drilled using hollow-stem auger ranging in depths between 22 feet and 41.5 feet.
- Six test pits G10-TP01 to G10-TP06 were excavated to between 8 feet and 13 feet depths.
 - Test Pit G10-TP01 was completed within the footprint of the preferred tank site.
 - Remaining test pits targeted the proposed new cell and especially the ponded area.

Fieldwork was conducted from September 14 to 22, 2010. The field investigation was supervised by a Golder geologist who directed the investigations and logged the recovered soils. Golder subcontracted drilling services to Denali Drilling, Inc. (Denali) of Anchorage, AK. The drilling operation included a truck-mounted Mobil B-61 drill rig.

Two methods of advancing boreholes were used. For the deeper boreholes planned in the middle of tanks (G10-BH01 and G10-BH02), the water rotary method of exploration consisted of driving 4.5-inch O.D. HW-R casing with a 340 lb hammer (rope and cathead method) and then drilling and washing out the overburden with a 3.75-inch diameter tri-cone bit with carbide buttons. For shallower boreholes on the perimeter of the tanks (Boreholes G10-BH03 to G10-BH06), 4.25-inch I.D. hollow stem auger was advanced.

Once the water-rotary or hollow-stem-auger boreholes were cleaned out, representative samples of the soils encountered in the borehole were obtained by driving a 3.0-inch O.D., 2.5-inch I.D., heavy duty split-spoon sampler ahead of the casing or auger with a 340-lb hammer (rope and cathead method) allowing for 30-inch free fall. Drive samples were generally collected at 5 feet, 7.5 feet, 10 feet, 15 feet, 20 feet, and then 10-foot intervals thereafter, and are noted as "HD" on the test hole logs presented in Appendix A. The number of blows required to drive the sampler each 6-inch interval of the sampling attempt is recorded on the borehole logs. In addition, the total number of blows required to advance the sampler through the 6-inch to 18-inch sampling interval is presented as "N" on the test hole logs. Note that the blow counts shown on the test hole are field values that have not been corrected for overburden



pressure, sampler size, hammer energy, heaving conditions, or other factors. Grab samples were also collected near the surface of the boreholes.

Test pits were excavated using a Volvo EC160CL tracked excavator operated by City of Unalaska personnel. The excavator had a 5-tooth, approximately 3.5-foot-wide bucket. Test pits were backfilled with natural gravel and cobbles, and at certain explorations, with processed crushed rock. In addition, the artificial fill at boreholes G10-BH01 and G10-BH02 was excavated first and backfilled with processed crushed rock, to allow easier advancement of the drill casing. Without excavation and replacement, there was doubt that the casing could be driven through the shot rock fill.

Representative samples obtained from the borehole and test pit explorations were visually classified in the field according to the Unified Soils Classification (USCS) System that is summarized in Figure A-1 in Appendix A. Samples were sealed in double plastic bags for transport to Anchorage for further examination, classification, and testing at EMC Engineering LLC. Logs of test holes are presented in Appendix A.

Following completion of the boreholes, depth to groundwater below ground surface (bgs) was noted using a water level indicator and borings backfilled with cuttings and available fill. In select boreholes, PVC standpipes were installed with either flush mount metal caps or top of PVC buried below grade. Times of water level measurements were noted to correlate to tidal variations. Groundwater levels are shown on the record of borehole logs (Appendix A).

A selection of site photographs showing drilling and site conditions are presented in Appendix C.

Assistance was provided from the several City of Unalaska personnel, including Mr. Tyler Zimmerman, Ms. Nancy Peterson, Mr. Jim Dickson, Mr. Bob Miner and staff at the bailer facility, and excavator operator Mr. Nolie Magpantay.

3.2 Laboratory Testing

Laboratory tests were performed to measure index properties of the recovered samples to confirm the field classifications and for use in determining the engineering properties of soils encountered. Moisture-content tests were run on each representative sample and generally conducted according to procedures described in ASTM D 2216. In addition, grain-size sieve analysis (ASTM C 117/ C 136) and Atterberg Limits testing (ASTM D 4318) were conducted on select samples.

Results of the grain-size analyses are summarized in Table 3-1. Plots of grain-size distribution, Atterberg Limits, and a table summarizing moisture contents are included in Appendix B. Testing results are also summarized on the log of test holes adjacent to the samples tested (Appendix A).

**Table 3-1: Results of Grain-Size Analyses**

Boring/Pit	Sample Number	Depth		Percent			USCS Symbol
		From	To	Gravel	Sand	#200	
G10-BH01	12	90.0	92.0	40	57	3	SP
G10-BH02	4	30.0	32.0	61	34	5	GW-GM
G10-BH03	5	20.0	21.5	2	91	7	SP-SM
G10-BH03	6	30.0	31.5	56	35	9	GP-GM
G10-BH04	3	7.5	9.0	62	30	8	GP-GM
G10-BH04	5	15.0	16.5	29	65	6	SP-SM
G10-BH04	8	40.0	41.5	50	40	10	GP-GM
G10-BH05	4	10.0	12.0	50	44	6	GP-GM
G10-BH06	5	15.0	17.0	48	42	10	GP-GM
G10-TP01	2	3.0	4.0	66	27	7	GP-GM
G10-TP01	4	8.0	9.0	71	27	2	GP
G10-TP02	3	10.0	13.0	79	20	1	GP
G10-TP05	3	8.0	10.0	52	46	2	GW

Note: USCS symbols are explained in more detail in Figure A-1 in Appendix A



4.0 SUBSURFACE CONDITIONS

4.1 Soil

Soil conditions encountered on-site are described below according to general categories or geologic units.

- **D-1 Surface Course:** In most trafficable areas at the preferred tank site, there is approximately 0.5 feet of loose to compact, wet, gray, poorly graded gravel as surface course (e.g., "D-1").
- **Shot Rock Fill:** Shot-rock fill mantles much of the site and commonly extends down to 5 to 7.5 feet depth. Shot-rock fill consists of compact to dense, wet, rusty orange and gray, poorly graded gravel, with some to mostly cobbles. Cobbles are angular and up to 12-inch size. Boulders are also likely to be present within this unit.
- **Clay and Silt:** Beneath the shot-rock fill, very soft, moist-to-wet, brown and gray clay and silt from approximately 1 to 4 feet thick was encountered in several boreholes and test pits at the preferred tank location and new cell. This unit was not present in the explorations for the alternate tank site.

Three main types of soils were encountered at depth beneath the fill and clay/silt units:

- **Beach Cobbles and Gravel:** consisted of compact, wet, brown above the water table, gray below water table, poorly graded gravel with cobbles. In test pits, this unit was observed to have some to mostly subrounded cobbles with apparent horizontal layering. Trace white sea shells were observed. In test pits, the walls of this unit would collapse on all four sides of the test pit when below water table.
- **Beach Sands:** Beach sand typically underlies the beach gravel unit. Beach sand consists of compact, wet, brown, poorly graded sand, fine to medium sand grains, with trace subrounded gravel up to 0.75 inches in diameter, and trace white sea shells.
- **Silty Gravel:** Below is a unit of compact, wet, tan and light green, subangular and subrounded gravel to 2.5 inch size, trace cobbles. This unit may represent alluvial or colluvial deposits rather than shoreline deposits. Boulders may also be present within this unit.

4.2 Bedrock

Bedrock was encountered at both of the test holes completed at the alternate tank site, at 35.5 feet in depth in borehole G10-BH02 and 25.0 feet in depth in G10-BH06. Bedrock was not cored and is inferred from tri-cone drilling and heavy-duty split spoon sampling. Bedrock was not encountered at the bottom of exploration (92.0 feet) in G10-BH01 at the preferred tank site. The bedrock surface is inferred to dip down to the northwest, perhaps more steeply beneath the preferred tank site. Bedrock sampled from G10-BH06 is fresh to slightly weathered, fractured, dark green, fine-to-medium grained, strong to very strong, volcanic sedimentary bedrock (e.g., sandstone) of the Unalaska Formation.



4.3 Groundwater

Groundwater measurements ranged from 4.6 to 7.8 feet bgs at the preferred tank site, and 7.6 to 9.5 feet at the alternative tanks site. Most of the water-level measurements presented in the borehole logs (Appendix A) were taken on September 21, 2010 where low tide for the day was 1.0 feet at 11:29 am, and high tide was 2.6 feet at 6:09 pm, relative to MLLW (Alaska Tide Book Company 2010). Water level variations in pairs of measurements from the time of low tide verses high tide ranged from approximately 0.1 to 1.4 feet. For 2010, the minimum low tide is -1.3 feet and the maximum high tide is 4.9 feet, relative to MLLW (Alaska Tide Book Company 2010). The water table was shallower at the preferred tank site closer to the coastline, and deeper at the alternate tanks site.

Water in the pond is inferred to be perched on the clay unit. The water level in the pond is reported not to be influenced by tidal fluctuations (Stepp 2010).



5.0 SEISMIC DESIGN PARAMETERS AND LIQUEFACTION POTENTIAL

5.1 Seismic Design Parameters

The landfill is situated in an area subject to strong ground motions and is underlain by compact to very dense cohesionless beach deposits. The U.S. Geologic Survey (USGS) has developed estimates of peak ground accelerations for many areas of the United States; this information is available on the internet. At the Unalaska Landfill site (latitude 53.8874°, longitude -166.5049°), the USGS U.S. Seismic “DesignMaps” Web Application data and our previous work at the site (Golder- 2006) indicates that a peak ground acceleration (PGA) of 0.64 g corresponds to the 2,475-year return period acceleration (10 percent in 250 years, per Resource Conservation and Recovery Act (RCRA) Subtitle D guidance, 40 CFR 258.14(b)(2)).

Based on the borehole data and interpretation of the site geology we interpret the site to have a Class F designation due to the presence of liquefiable soils. Site Class F technically requires a site-specific analysis; however, a site-specific analysis is generally not performed for a project of this size. We performed a liquefaction assessment, which is discussed below, and have prepared engineering recommendations to account for the liquefiable soils, namely that the tank foundation be installed below the liquefiable soils. We consider that the liquefied soil design parameters provided later in this report combined with a Site Class D designation are conservative for project design. Liquefied soils will tend to damp the ground amplifications compared to Site Class D soils. We consider our design recommendations conservative because we account for the liquefaction induced settlement and strength reduction without reducing the ground amplification. Golder should be contacted if a full site-specific response analysis is required.

The following design parameters are based on the 2009 IBC Maximum Considered Earthquake (MCE) Ground Motion for the project site. The interpolated probabilistic ground motion values were obtained from the USGS java application Seismic Hazard Curves and Uniform Hazard Response Spectra, Version 5.1.0 – 02/10/2011 (<http://earthquake.usgs.gov/hazards/designmaps/javacalc.php>). The following results were obtained for latitude 53.8874° and longitude -166.5049°:

Short (0.2 second) Spectral Response (S_s): 1.49 g

Long (1.0 second) Spectral Response (S_1): 0.56 g

Note that these numbers correspond to Site Classification B and must be adjusted for Site Classification using the IBC procedures. Values adjusted for Site Classification D are as follows:

Short (0.2 second) Design Spectral Response (S_{Ds}): 0.99 g

Long (1.0 second) Design Spectral Response (S_{D1}): 0.56 g



In 2008, USGS updated the 1999 probabilistic seismic hazard assessment (PSHA) data for Alaska, based in part on reporting from Wesson et al. (2007). The 2008 USGS data has been integrated into the latest version of ASCE 7-10 (2010) and is slated for integration into the 2012 IBC. The proposed updates by USGS/Wesson suggest very minimal changes in spectral acceleration values for Unalaska, and since the data has not been adopted by IBC, it is not integrated into our recommendations.

5.2 Liquefaction Analysis

Liquefaction is a phenomenon by which soils can lose significant strength due to ground motions produced by earthquakes. Liquefaction susceptibility and liquefaction-induced settlement analyses were performed for each borehole using the commercially available software LiquefyPro version 5.0 produced by CivilTech. The liquefaction analysis assumed a groundwater elevation of +3 feet which corresponds approximately to high tide conditions for the day the measurements were taken. The peak ground acceleration of 0.64 g reported above was used in the analyses, and an aggregated mean Moment Magnitude M_w 6.7 earthquake was assumed based on deaggregation of the various seismic hazards (by USGS, 1999).

A liquefaction analysis calculates liquefaction susceptibility by computing a factor of safety against liquefaction, found by dividing the cyclic resistance ratio (CRR) by the cyclic stress ratio (CSR). Soils are expected to liquefy if the factor of safety is less than 1.0. LiquefyPro calculates CSR for borehole data using the procedure by Seed and Idriss (1971). LiquefyPro calculates CRR for borehole data based on the procedure presented in Youd and Idriss (2001). We reviewed recent publications by Seed et al. (2003) and Idriss and Boulanger (2008) with regard to calculating liquefaction potential. Based on our review of these documents, it is our opinion that for the given ground motions and subsurface data, the computational methods used by LiquefyPro are valid for this analysis. In addition to causing significant strength loss of susceptible foundation soils, settlements will occur where liquefaction occurs. We used Ishihara and Yoshimine's (1992) method (as implemented in LiquefyPro) to calculate liquefaction-induced settlements at each borehole location.

The field blow counts were adjusted for various factors, including: hammer weight, split spoon sampler size, borehole diameter, rod length, sample set-up, and energy ratio (ER) relative to 60 percent theoretical energy efficiency of SPT, to convert them to equivalent SPT values. Blow counts were also normalized to a common reference value of effective overburden stress (100 kiloPascals, or approximately 1 ton/sq ft). The product of these factors determines corrected SPT $(N_1)_{60}$ values. In order to evaluate the soils resistance to liquefaction, one other correction factor was applied that accounts for the fines content in the soil sample. Applying the appropriate correction factor results in consistent set of "N-values" referred to as $(N_1)_{60 C-S}$. For this site we also applied a correction factor to the gravel samples. We chose a correction factor of 1.8 for gravel based on our review of Evans and Zhou (1995), Yasuda et al. (1997), and Yan and Lum (2003).



In general, the beach sand deposits encountered across the site are considered susceptible to liquefaction. The liquefaction analysis results are summarized in Table 5-1 and output from LiquefyPro is included in Appendix D.

Table 5-1: Liquefaction Analysis Results Summary

Borehole	Location	Maximum Depth of Liquefaction	Estimated Liquefaction-Induced Settlement
G10-BH01	Preferred Location – Center	70 feet bgs	5 to 6 inches
G10-BH03	Preferred Location – Perimeter	22 feet bgs	3 to 4 inches
G10-BH04	Preferred Location – Perimeter	33 feet bgs	6 to 7 inches
G10-BH05	Preferred Location – Perimeter	24 feet bgs (bottom of hole)	3 to 4 inches
G10-BH02	Alternate Location – Overlap of 1 & 2	NL	NL
G10-BH06	Alternate Location 2 – Perimeter	17 feet bgs	1.5 inches

Notes: bgs = below ground surface, NL = No liquefaction predicted

5.3 Seismic Stability

In addition to liquefaction induced settlement, there is the potential for liquefaction induced lateral spreading. Lateral spreading can occur on sites with sloping ground surfaces or on flat ground surfaces adjacent to steep banks (referred to as a “free-face”). Using the empirical equations developed by Bartlett and Youd (1992), we estimated negligible impacts on the tank locations.



6.0 DRIVEN PILE FOUNDATIONS

The tank foundations will need to be designed to support the tank loads for both static and seismic (liquefied) conditions and applicable axial and lateral loadings. The liquefaction induced settlement is unlikely to be acceptable at the preferred tank location and therefore a deep foundation system will be required. A reinforced concrete mat, pile cap, or other method will be required to support and transfer the loading from the tank to the piles.

Driven, steel pipe piles are a feasible deep foundation type for this project. Drilled piers may be difficult to advance, particularly at the preferred location, due to the potential for collapsing and sluffing sand layers beneath the water table. The presence of cobbles and dense gravels may cause damage to driven concrete piles or cause deflection of steel H-piles. The presence of cobbles and dense gravel layers may make reaching the required depth difficult with a large displacement pile (e.g. closed end pipe), so an open ended steel pipe may be a more feasible approach to reach the required depth. Piles will not prevent liquefaction from occurring, but rather will transfer loads into the soils underlying the liquefiable soils and reduce settlement of the tank. Piles should be installed below the liquefiable zones. Although the pile design and selection will be performed by others, for purposes of this analysis, two sizes of piles were considered: 16-inch and 24-inch outside diameter.

The following design information is presented in the following subsections for the preferred and alternate tank sites:

- Axial resistances in compression and uplift for both pile sizes and for both static and liquefied conditions.
- Estimated downdrag loads acting on the piles due to liquefaction-induced settlements.
- Lateral pile design parameters for both static and liquefied conditions.

6.1 Axial Design Parameters

The axial resistances in compression and uplift for 16 and 24-inch steel pipe piles were calculated using the API RP-2A (1994) method as implemented in the computer program A-Pile version 5.013 developed by Ensoft, Inc (Ensoft 2001a,b). The piles were modeled open-ended with wall thicknesses of 0.5 and 1 inch. Pile plugging was accounted for based on a relationship between the pile length and pile diameter and is reflected in the calculated resistance values.

Soil strengths for cohesionless soils were based on correlations that take into account the blow count and overburden pressure. Soil strengths of cohesionless soils were based on correlations of field blow count corrected for hammer type, fines content measured in the laboratory or interpreted from visual observations, and overburden pressure.



6.1.1 Ultimate Axial Resistance

Ultimate pile resistance curves for static conditions at the preferred and alternate tank locations are presented in Figures 3 and 4. We recommend a factor of safety of 3.0 for allowable resistance for the static case.

Ultimate pile resistance curves for liquefied ground conditions for the preferred and alternate tank locations are presented in Figures 5 and 6. We recommend a factor of safety of 1.01 for allowable resistance for the liquefied condition.

6.1.2 Axial Group Effects

The overall allowable axial resistance of a large group of piles can be less than the sum of the individual pile capacities. For the conditions encountered at the site, a reduction in the individual pile resistance to account for group effects is usually not necessary for piles having a center-to-center spacing of 2.5 pile diameters or greater. Golder should be provided final design plans to verify that group effects will not affect foundation performance.

6.1.3 Downdrag Load due to Liquefaction

Liquefaction of the foundation soils during the design seismic event will result in settlement of the liquefiable soil mass (and all non-liquefiable soils overlying them) relative to the piles. This phenomenon is called downdrag and results in downdrag loads acting on the piles. We calculated downdrag loads based on equivalent undrained shear strengths as proposed by Seed and Harder (1990) using the alpha (α) method. Table 6-1 presents the calculated downdrag loads for individual, isolated piles spaced 2.5 pile diameters center-to-center or more.

Table 6-1: Downdrag Loads

Tank Location	Pile Diameter	Downdrag Load
Preferred	16-inch	237 kips
	24-inch	356 kips
Alternate	16-inch	40 kips
	24-inch	60 kips

The drag loads presented in Table 6-1 are unfactored and should only be used for the load case corresponding to liquefied conditions. Actual magnitudes of the drag load may be different than those presented in Table 6-1 and will vary in part on pile spacing and pile arrangement. We recommend that the drag loads presented in Table 6-1 be verified once pile diameter, spacing and arrangements are determined. The drag load should only be used to check the structural capacity of the pile under the seismic design case.





6.1.4 Settlement under Loads

The magnitude of settlement of the pile foundations under loads depends on the pile configuration and the magnitude of the loads themselves. We calculated preliminary estimates of settlement under static loads, which are presented in Figures 7 and 8. One to two inches of additional settlement is anticipated from seismic loading. We did not include group effects in our settlement analysis because the pile configuration has not been determined. Additional settlement analysis should be performed after the pile section, configuration, and loads have been determined.

6.2 Lateral Design Parameters

The design of driven steel pipe piles subjected to lateral loads should take into account such factors as relative rigidity of the pile to the surrounding soil, the fixity condition at the pile cap level, the structural resistance of the pile to withstand bending moments, the soil resistance that can be mobilized, and the maximum tolerable deflection at the head of the pile. Both the structural and geotechnical capacities should be determined to establish the governing case.

A lateral load analysis was beyond the scope of this investigation; Golder was asked to provide lateral resistance analysis parameters. The parameters presented in the following subsections can be used directly with the widely-used commercial program L-Pile produced by Ensoft, Inc. The parameters presented in the following tables account for the unstable soil mass moving relative to the piles as indicated.

6.2.1 Lateral Pile Resistance Parameters

A design profile for lateral pile resistance was developed for both tank locations. Separate profiles were developed for static and liquefied conditions. Symbols used in Tables 6-3 through 6-6 are explained in Table 6-2. Recommended lateral pile resistance parameters are presented in Tables 6-3 through 6-6.

Table 6-2: Symbols Used for Lateral Pile Resistance Design Parameters

Symbol	Meaning
γ'	Effective unit weight
Φ	Friction angle
K	p-y modulus
C	Undrained cohesion
E_{50}	Strain factor



Table 6-3: Lateral Pile Resistance Design Parameters, Preferred Location Static Conditions

Depth (feet)		Soil Model	γ' (pci)	ϕ (deg)	k (pci)	c (psi)	E_{50}
From	To						
0	4.5	API Sand	0.078	38	90	-	-
4.5	15	API Sand	0.042	38	75	-	-
15	35	API Sand	0.042	34	60	-	-
35	50	API Sand	0.042	38	90	-	-
50	65	API Sand	0.042	34	75	-	-
65	70	API Sand	0.042	38	105	-	-
70	90	API Sand	0.042	38	125	-	-

Table 6-4: Lateral Pile Resistance Design Parameters, Preferred Location Liquefied Conditions¹

Depth (feet)		Soil Model	γ' (pci)	ϕ (deg)	k (pci)	c (psi)	E_{50}
From	To						
0	4.5	API Sand	0.078	38	90	-	-
4.5	15	API Sand	0.042	38	60	-	-
15	35	Soft Clay	0.042	-	-	4.2	0.01
35	50	API Sand	0.042	38	60	-	-
50	65	Soft Clay	0.042	-	-	5.2	0.01
65	70	Soft Clay	0.042	-	-	4.2	0.01
70	90	API Sand	0.042	38	125	-	-

Note: Shading indicates layers expected to liquefy

Table 6-5: Lateral Pile Resistance Design Parameters, Alternate Location Static Conditions

Depth (feet)		Soil Model	γ' (pci)	ϕ (deg)	k (pci)	c (psi)	E_{50}
From	To						
0	7.5	API Sand	0.078	34	90	-	-
7.5	15	API Sand	0.042	34	60	-	-
15	17	API Sand	0.042	38	75	-	-
17	35	API Sand	0.042	38	90	-	-

Table 6-6: Lateral Pile Resistance Design Parameters, Alternate Location Liquefied Conditions¹

Depth (feet)		Soil Model	γ' (pci)	ϕ (deg)	k (pci)	c (psi)	E_{50}
From	To						
0	7.5	API Sand	0.078	34	90	-	-
7.5	15	API Sand	0.042	-	-	5.2	0.01
15	17	API Sand	0.042	-	-	5.2	0.01
17	35	API Sand	0.042	38	60	-	-

Note: Shading indicates layers expected to liquefy



6.2.2 Lateral Group Effects

The overall allowable lateral resistance of a large group of piles can be less than the sum of the individual pile capacities. For the conditions encountered at the site, a reduction in the individual pile resistance to account for group effects is usually not necessary for piles having a center-to-center spacing of 3 to 5 pile diameters or greater. Golder should be provided final design plans to verify that group effects will not affect foundation performance.

6.3 Pile Cap Embedment

We recommend a minimum pile cap embedment of 36 inches.



7.0 SHALLOW FOUNDATIONS FOR ALTERNATE TANK LOCATION

If the tank is sited at the Alternate location, shallow spread footings may be feasible to support the tank. The design of the tank on shallow foundations must consider the following:

- Total and differential settlements across the diameter of the tank due to static loading.
- Total and differential settlement across the diameter of the tank due to liquefaction.
- Ability of the tank to withstand differential movements.
- Seasonal frost action.
- Seismic loading.

7.1 Tank Loading and Static Settlement

We understand the proposed leachate tank is 90 feet in diameter and 40 feet tall. We estimate the maximum bearing pressure along the base of the tank will be on the order of 2,500 pounds per square foot (psf). The total and differential settlement was calculated using the commercially available software package Settle3D version 1.013 by Rocscience. For a 90-foot diameter tank, foundation embedded 36 inches, and a 2,500 psf bearing pressure (at the Alternate location), we calculate the following:

- Total settlement – 3 to 3.5 inches
- Differential settlement – 1.5 to 2 inches

This settlement is expected to occur as the tank is constructed and filled with leachate. If the tank is constructed on a mat foundation, we calculate total settlement on the order of 2 to 2.5 inches.

These values of settlement are for static load conditions. Additional total and differential settlement will occur due to seismic loading and liquefaction.

7.2 Seismic Loading and Liquefaction Settlement

As noted in Section 5.0 Seismic Design Parameters and Liquefaction Potential, the project site is subject relatively strong ground motion. If the tank is constructed on shallow foundations, there will be the potential for settlement due to seismic loading. We calculated settlement on the order of 1.3 inches for the Alternate tank location due to liquefaction. We estimate an additional 1 to 2 inches of total settlement and 1 to 2 inches of differential settlement due to seismic loading and liquefaction.

7.3 Shallow Foundation Design Parameters

Shallow foundations should be designed based on the following parameters:

- Maximum Allowable Bearing Capacity: For design purposes, we recommend an allowable bearing capacity of 3,000 psf (F.S.=3) for footings founded on compact to dense granular soil encountered in our borings at the project site. The allowable bearing capacity may be increased by 1/3 for short-term wind and seismic loading.



- Allowable Base Friction (soil and cast-in-place concrete):.....0.3 (F.S.=1.5)
- Allowable Passive Resistance on Sides of Footing: For design purposes, we recommend the allowable passive pressure (F.S. = 2.5) be based on an equivalent fluid density of 200 pcf on the sides of buried footings. We recommend the average allowable lateral pressure be limited to 500 psf to limit lateral movement to less than approximately 1/2 inch. These values can be increased by 1/3 for seismic loading.
- Minimum Width for Perimeter Footing:.....24 inches
- Minimum Embedment for Frost Protection:36 inches

These design parameters are applicable to both shallow foundations for the proposed tank and the proposed lightly loaded metal building.

7.4 Settlement Considerations

If the tank cannot be designed to accommodate the total (4 to 5.5 inches) and differential settlements (2 to 4 inches), the tank can be supported on pile foundations. Design parameters for driven pile foundations were presented for the alternate site in Section 6.0.



8.0 CONSTRUCTION CONSIDERATIONS

8.1 Earthworks

Depending upon the design alternatives selected, site work may include pile driving and excavations for shallow foundations. Placement of structural fill may be required around foundations and to establish final site grades. Earthwork materials and methods should be selected so that required properties can be achieved under wet weather construction conditions.

8.1.1 Site Preparation

Site preparation work will be minor at both tank locations and will largely include leveling the areas and the removal of deleterious material.

8.1.2 Subgrade Preparation

Subgrade preparation will consist of either minor cuts into the existing shot rock fill or placement of structural fill to achieve desired site grades. The subgrade soils should be prepared in accordance with the recommendations in this section to achieve a firm and unyielding condition. Prior to placing footings, the subgrade should be observed by a Golder representative during a "proof roll" completed by a fully loaded dump truck. Loose or excessively yielding areas should be remediated or over-excavated and replaced prior to placement of structural fill.

8.1.3 Fill Materials and Placement

The onsite soils will likely be suitable for reuse as structural fill, however material from onsite excavations should be observed by a qualified engineer prior to being used as structural fill. Other fill materials may be used with approval of Golder. Structural fill should be free of organic and inorganic debris, be near the optimum moisture content, and be capable of being compacted to the 95 percent of maximum dry density as determined by ASTM D 1557 (modified Proctor). If the required compaction criteria cannot be achieved using the on-site soils, then an imported structural fill material may be needed. Structural fill imported for use during wet weather should consist of a non-plastic, well graded soil free of organic material, with less than 5 percent fines (that portion of the soil that passes the U.S. No. 200 sieve).

Fill should be compacted with equipment suitable to achieve proper compaction and lift thickness should be limited to 12 inches (loose lift thickness). If density tests taken in the fill indicate that compaction is not being achieved due to high moisture content, then the fill should be scarified, moisture-conditioned, and re-compacted. If the required densities cannot be met then the material should be over-excavated and replaced with a suitable material or a soil admixture used to dry the soil.

The structural fill beneath structures should at a minimum extend laterally at a 1H:1V slope projected down and away from the bottom edge of the footing or pile cap.



8.2 Pile Installation

Quality control of driven pipe piles can be achieved by field observations supplemented by dynamic load testing. A static load test may not be economical, but we recommend dynamic testing and signal matching. We recommend that 10 percent of the piles be instrumented with a pile driving analyzer (PDA) and signal match during installation. This number may be refined as design progresses and the total number of piles is determined. In addition, we recommend that a test pile with dynamic monitoring is driven at prior to general pile driving. Restrike of piles should be carried out 3 days and 7 days after installation to confirm design resistance.

We recommend that a geotechnical engineer or their representative observe the installation of all piles. Good record keeping is important for addressing problems if they arise during construction and records provide invaluable information if future expansion is planned for the site. Construction considerations for the piles described in this report are presented below.

Pile drivability is an important consideration in the design of piled foundations. Selection of pile driving equipment is the responsibility of the contractor but is subject to approval by the Engineer. The hammer should be sized to achieve the ultimate pile capacity without damaging the pile, and compressive driving stress should not exceed 90 percent of the steel yield strength. We recommend that a pile drivability study be conducted once a hammer and pile size have been selected by the contractor prior to mobilizing equipment to the site. Golder can perform the drivability study using GRLWEAP by Pile Dynamics, Inc. which is a computer program for wave equation analysis of pile driving. The program simulates motions and forces in a driven pile. GRLWEAP can aid in selecting a proper hammer to drive the piles. GRLWEAP can be used to compute the following information important to construction:

- Blow count per unit length and blow rate
- The axial stresses (compressive and tensile) developed in the pile during driving
- The energy transferred by the hammer to the pile
- Practical refusal effort of the hammer

The blow counts are used to determine the relative ease and speed of pile driving. The axial stresses developed are compared to the yield stress of the steel to prevent pile damage during driving. Energy plots illustrate the efficiency of the selected pile hammer. Prudent use of the results from the drivability analysis is recommended. Soil response and hammer performance should be verified by static and/or dynamic measurements in the field.

At a minimum, we recommend that the minimum quality assurance plan for driven steel pipe piles consist of:

- Full-time observing and recording of the blow count and hammer stroke with a saximeter for each pile installed



- Confirm that bearing soils were encountered
- Record information of type of equipment used to drive the piles
- Verify that the piles conform to plan dimensions

8.2.1 Subsurface Obstructions

The contractor should be prepared for obstructions and hard driving. There is the potential for debris (e.g., large pieces of concrete, boulders, and shot rock) in layers of near surface fill. There is also the potential for zones of dense gravels and cobbles, and possibly boulders, that may be difficult to drive through. The contractor should have provisions available to advance the pile to depth. The contractor should also be equipped to clean out the inside of the piles and to remove obstructions in order to advance the piles to the required depths.

8.3 Utilities

Maintaining safe utility excavations is the responsibility of the utility contractor. The soil and groundwater conditions in the utility excavations will vary across the site. Due to the cohesionless nature of the site soils, caving of the trench walls should be anticipated, particularly if saturated soil or very loose to loose fill or native soil is encountered in the excavations. As appropriate, trench shoring should be used by the utility contractor.

Utility trench backfill is a concern in preventing settlement along utility alignments. It is important that each section of utility line be adequately supported in the bedding material. Fill should be carefully placed and hand tamped to about 12 inches above the crown of the pipe before heavy compaction equipment is brought into use. The remainder of the trench backfill should be placed and compacted in lifts having a loose thickness of 12 inches.

8.4 Geotechnical Construction Monitoring

Critical aspects of the foundation and earthwork should be observed and tested by Golder or by a qualified geotechnical engineering company. Construction observation and testing services may include but not be limited to foundation subgrade verification, gravel road subgrade verification, placement and compaction of structural fills, and pile installation.

8.5 Landfill Stability

Landfill slope stability was evaluated in 2008 as part of the preliminary design of the Unalaska Landfill Phase II expansion (Golder 2008). Stability was evaluated under both static and seismic loading conditions. The results of this analysis indicated that static factors of safety were all 2.0 or greater for the assumed geometry and material properties, which is above the standard-of-practice value of 1.5. Under seismic loading conditions, some factors of safety were less than 1.0, indicating that displacement would occur under the design earthquake event. However, a deformation analysis indicated that expected



deformations would be about 3 inches or less, well below the threshold at which significant damage would occur.

It should also be noted that the 2008 seismic stability analysis was quite conservative in that it assumed that the cross-stitching in the geosynthetic clay liner (GCL) had deteriorated, a process which in reality is expected to take at least a few hundred years. Marr and Christopher (2004) present a summary of several studies which suggest that a significant decrease in strength of the polymeric components of GCLs due to aging is unlikely because of the low oxygen levels in saturated bentonite. Based on aging tests on polypropylene fibers taken from GCLs, these studies estimated a design life in buried applications with 8 percent oxygen of more than 300 years. Actual performance life may be even longer due to lower oxygen levels in saturated bentonite as well as limited gas circulation within the liner. Furthermore, over this time period, the waste itself is likely to undergo significant decomposition, resulting in flatter cover slopes which will increase the factor of safety against sliding.

For this geotechnical report, we reviewed the previous stability analysis and offer the following conclusions and recommendations:

- Although the subsurface investigations were performed adjacent to, rather than within, the proposed footprint of the landfill, none of the materials encountered in the borings are inconsistent with the assumptions used for subgrade materials in the stability analysis.
- The subgrade below the landfill liner system should be firm and well compacted. Loose sediments, organic debris, peat, and other soft or otherwise unsuitable materials, such as those encountered in lagoon areas, should be removed until firm soil or bedrock is encountered. Ice and frozen soil should also be allowed to thaw or removed from subgrade areas. Overexcavated areas may need to be backfilled with structural fill to achieve a smooth, flat surface. The upper 6 to 12 inches of the final subgrade surface should be compacted by wheel rolling, vibrating compactor, or other suitable equipment.
- We understand that the proposed final geometry of the landfill liner, the waste fill, and the closure cover has not changed since the 2008 stability analysis, and therefore the analysis does not need to be repeated.
- The final design specifications for liner system materials should ensure that the minimum interface shear strength values of $c = 0$ psf and $\phi = 30^\circ$ assumed in the 2008 stability analysis are achieved, or some combination of values for these parameters that provides equivalent strength. This can be done by interface shear testing to qualify materials prior to preparing the specifications or by using values from the literature or previous projects. If during construction the liner system materials will be placed carefully and an adequate construction quality assurance (CQA) program will be implemented, then shear strength parameters can be evaluated at displacements slightly greater than those typically associated with peak strength, as opposed to very large displacements. Evaluation of strength parameters should be performed by the design engineer based on actual test data and engineering judgment.
- Although requiring the construction contractor to perform interface strength testing and submit the results to qualify liner materials is possible, this approach is not recommended because of potential delays, given the short construction season and difficult logistics at the site. Materials should be pre-qualified to the extent possible.



- Geomembrane should be textured; 60 mil is an acceptable thickness for this application.
- High density polyethylene (HDPE) or linear low density polyethylene (LLDPE) are appropriate geomembrane materials for this application.



9.0 USE OF THIS REPORT

This report has been prepared exclusively for the use of Bristol Environmental & Engineering Services Corporation and their consultants for specific application to leachate tank design at the sites indicated in this report. We encourage review of this report by bidders and/or contractors as it relates to factual data only (exploration logs, laboratory results, etc.). The conclusions and recommendations presented in this report are based on the explorations and observations completed for this study.

Judgment has been applied in interpreting and presenting the results. Variations in subsurface conditions are common, and actual conditions encountered may be different from those observed in the boreholes. If site project plans are developed based on our studies, we recommend that we be given the opportunity to review the plans and specifications to verify that they are in accordance with the conditions described in this report.

The explorations were performed in general accordance with locally accepted geotechnical engineering practice, subject to the time limits and financial and physical constraints applicable to the services for this project, to provide information for the areas explored. There are possible variations in the subsurface conditions between the test locations and variations over time.

The professional services retained for this project include only the geotechnical aspects of the subsurface conditions at the site. The presence or implication(s) of possible surface and/or subsurface contamination resulting from previous site activities or uses of the site and/or resulting from the introduction onto the site of materials from offsite sources are outside the scope of service for this report and have not been investigated or addressed.



10.0 CLOSING

It has been a pleasure to work with you on this project and we look forward to future cooperation on this and other projects. If you have any questions or require further information about this report, please contact us.

GOLDER ASSOCIATES INC.

A handwritten signature in black ink that reads "Frank S. Shuri".

Frank S. Shuri, PE
Principal

A handwritten signature in black ink that reads "Mark R. Musial".

Mark R. Musial, PE
Principal



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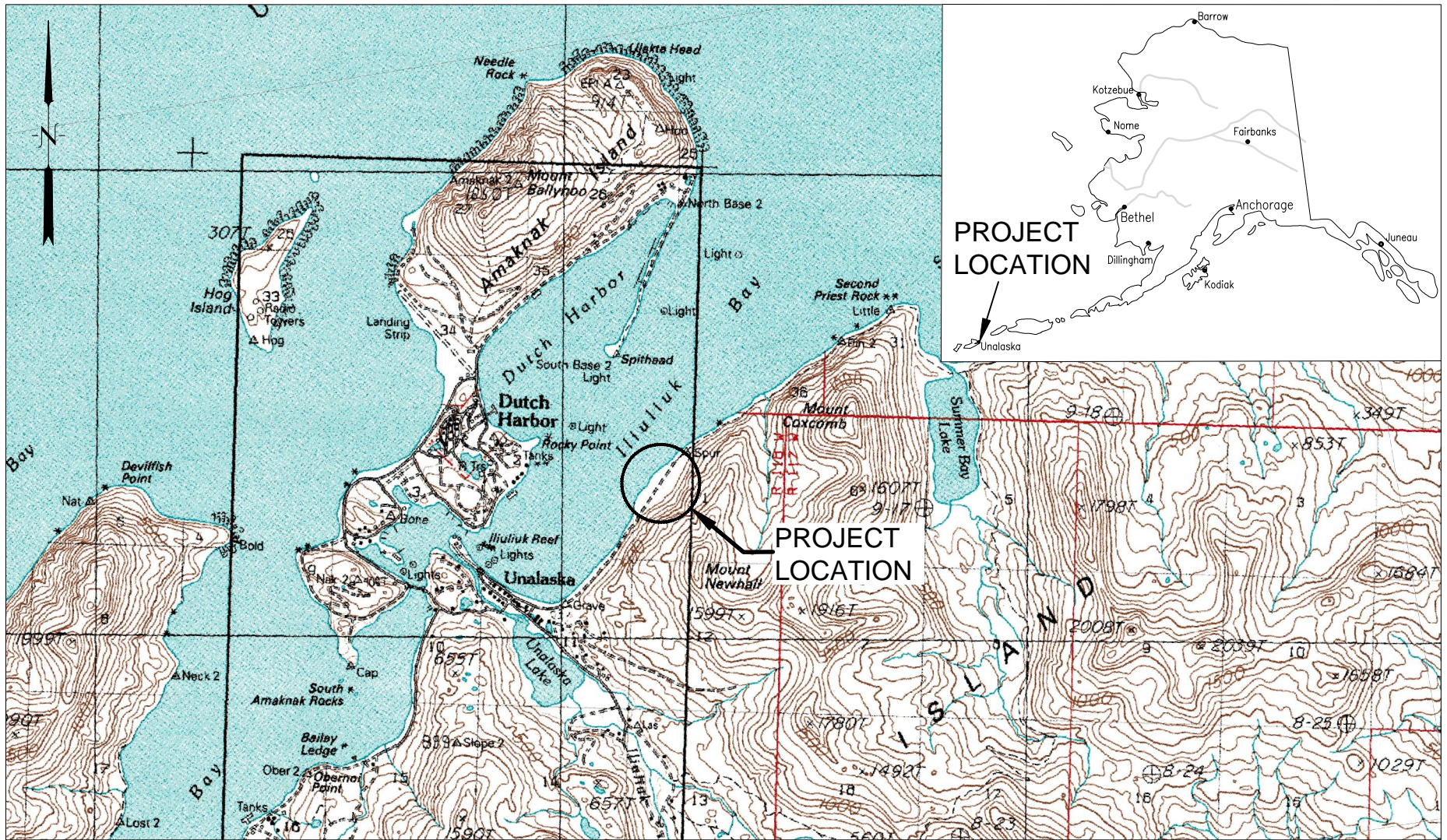


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FIGURES



REFERENCE

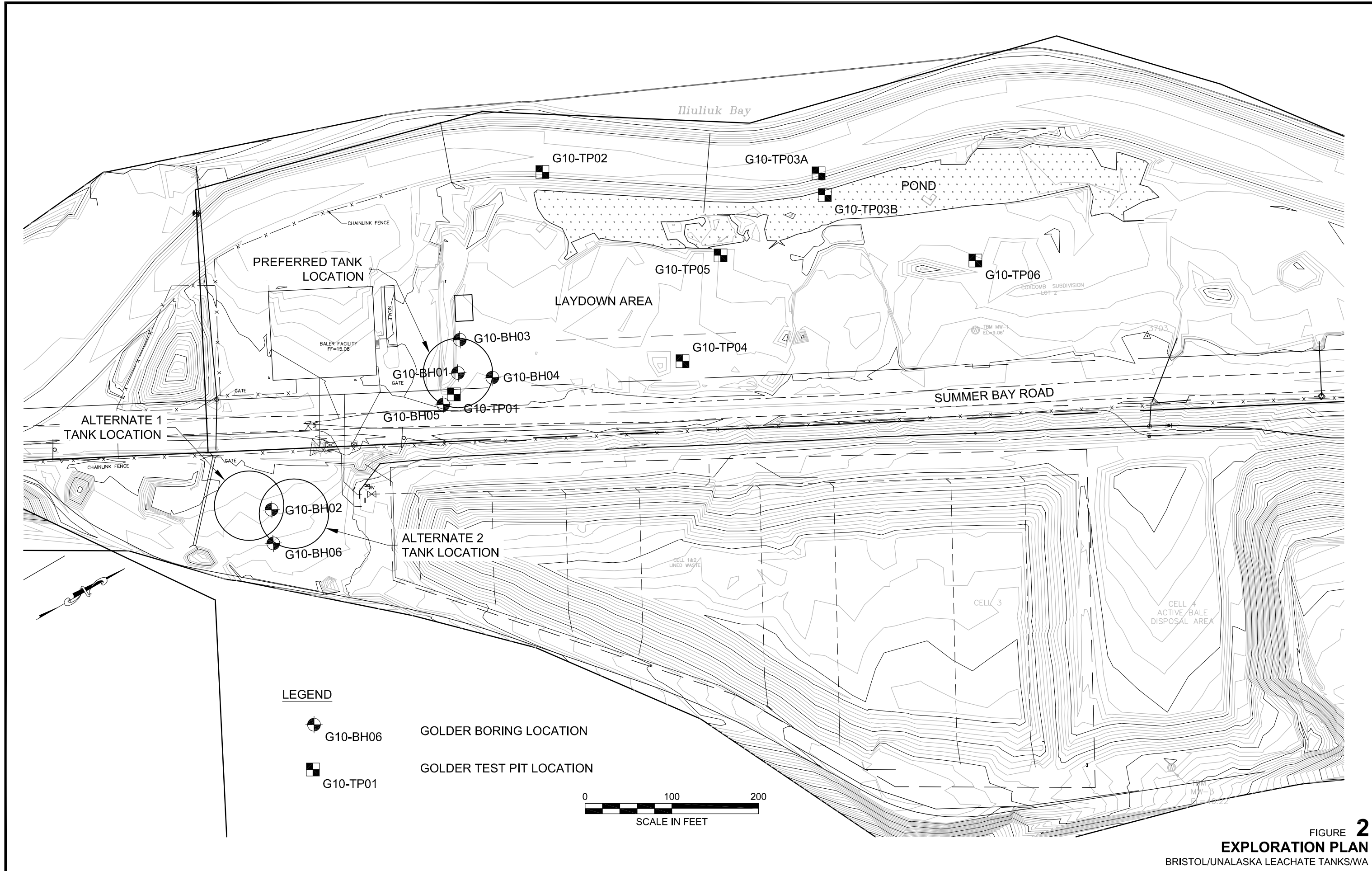
1.) MAP CREATED USING USGS 1:63360 SCALE TOPO MAPS AS PROVIDED BY THE STATEWIDE DIGITAL MAPPING INITIATIVE (SDMI)



FILE No.	VICINITY MAP FIG1.DWG	DATE	12/2/10
PROJECT No.	093-93387	REV.	0

SCALE AS SHOWN	TITLE
CADD	APG
DATE	12/2/10
CHECK	TER

VICINITY MAP	
UNALASKA LANDFILL LEACHATE TANKS UNALASKA, ALASKA	
BHC/BRISTOL/UNALASKA LEACHATE TANKS/AK	FIGURE 1



LEGEND



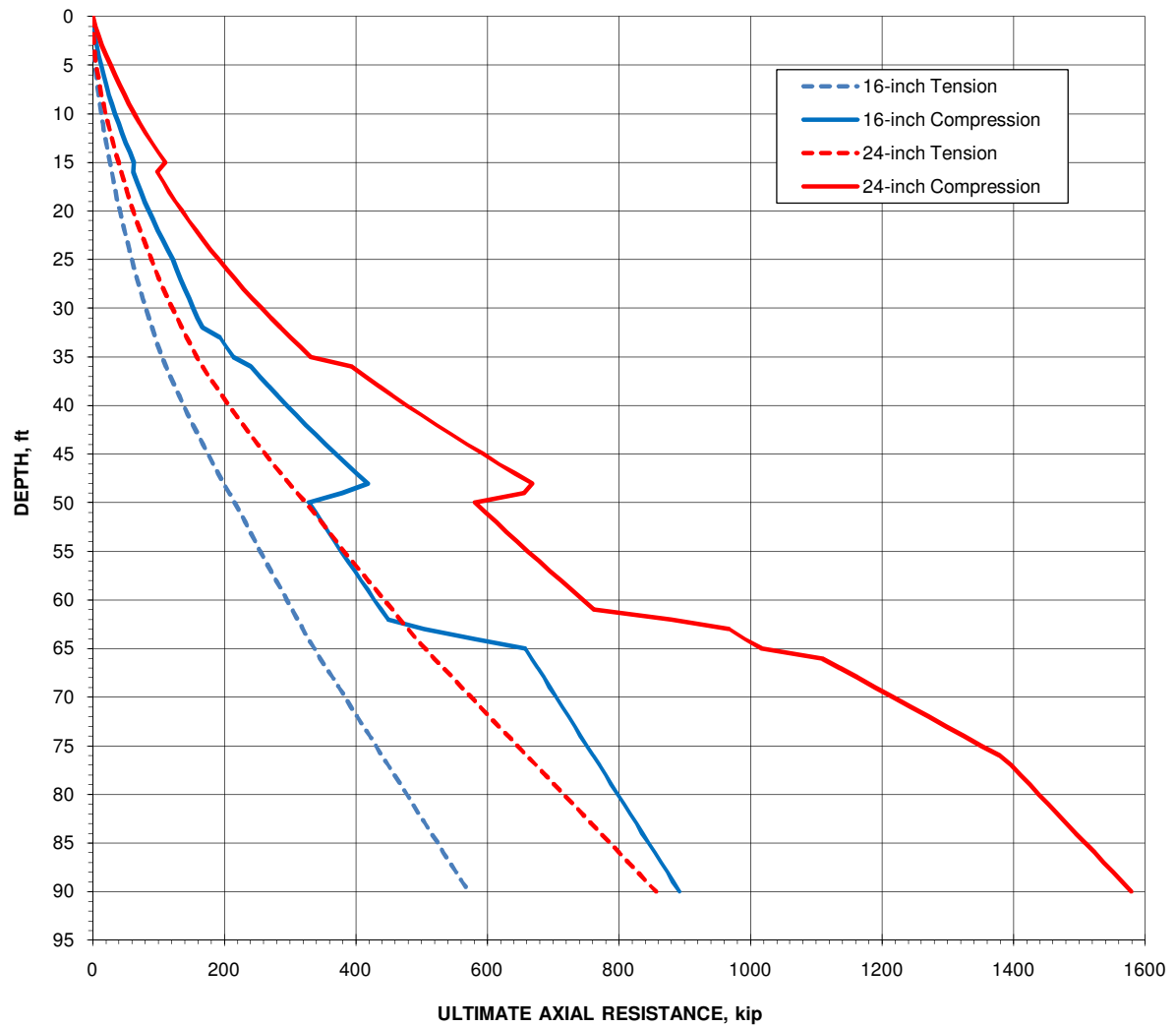
-  G10-BH06 GOLDER BORING LOCATION
-  G10-TP01 GOLDER TEST PIT LOCATION

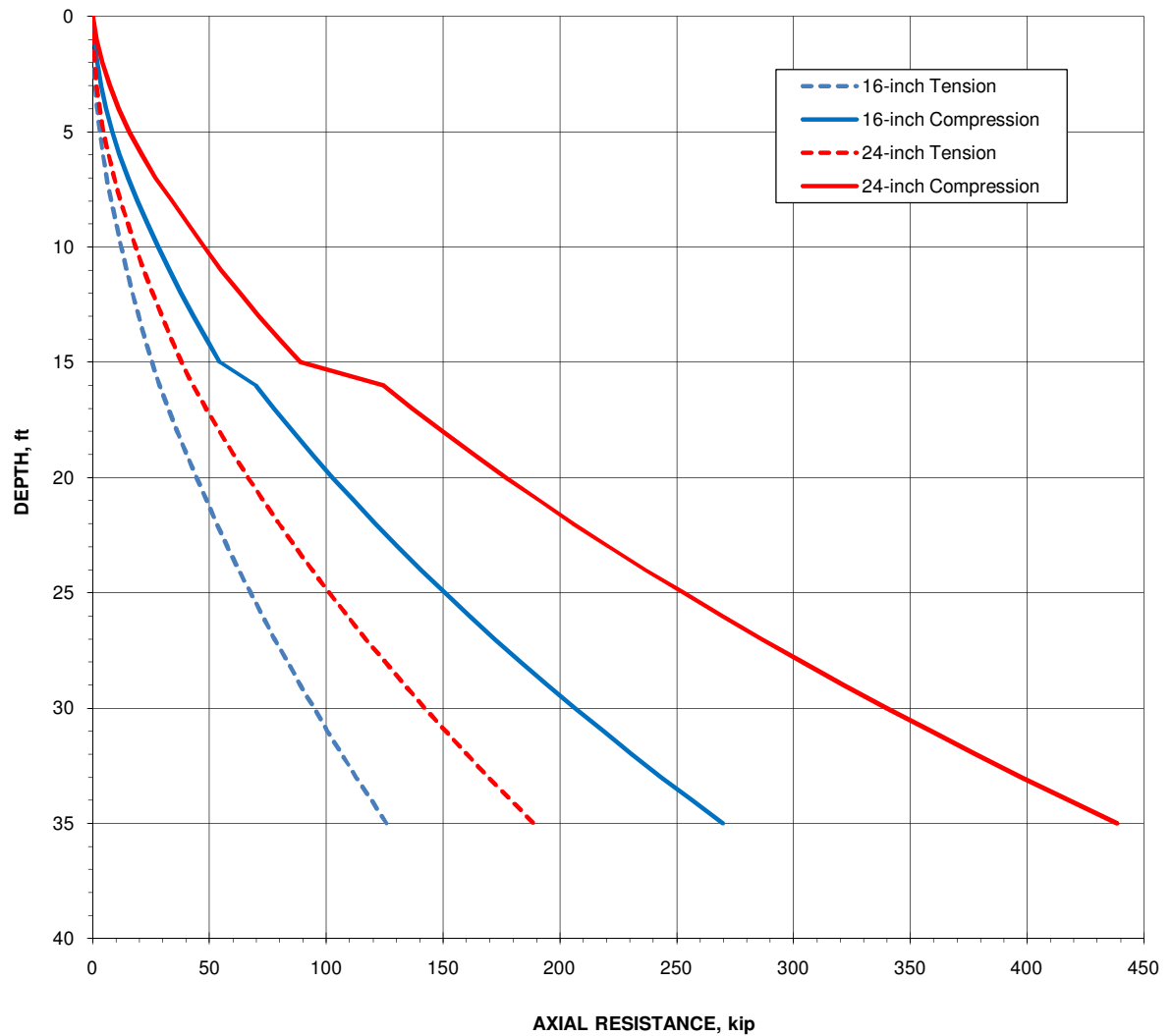


FIGURE 2
EXPLORATION PLAN
BRISTOL/UNALASKA LEACHATE TANKS/WA



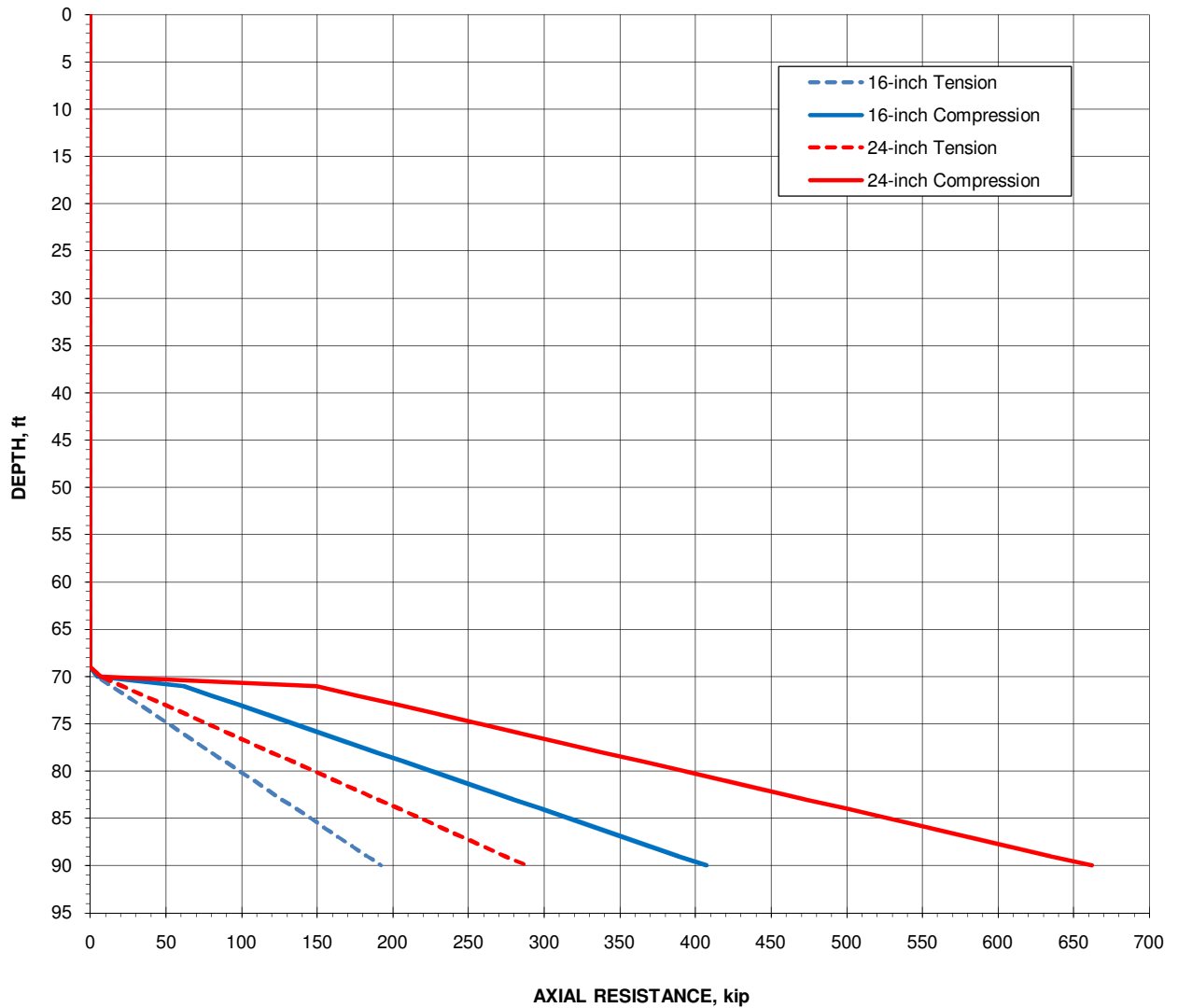
- Notes:**
1. Top of pile at ground surface
 2. Water is at 4.5 ft below ground surface
 3. Tension curves do not include the pile self-weight
 4. See report text for additional information on the use of this figure.
 5. Ultimate axial resistance shown
 6. We recommend FS=3 for allowable resistance

FIGURE **3**
AXIAL PILE RESISTANCE
PREFERRED TANK LOCATION
STATIC CONDITIONS
 BRISTOL/UNALASKA LEACHATE TANKS/WA



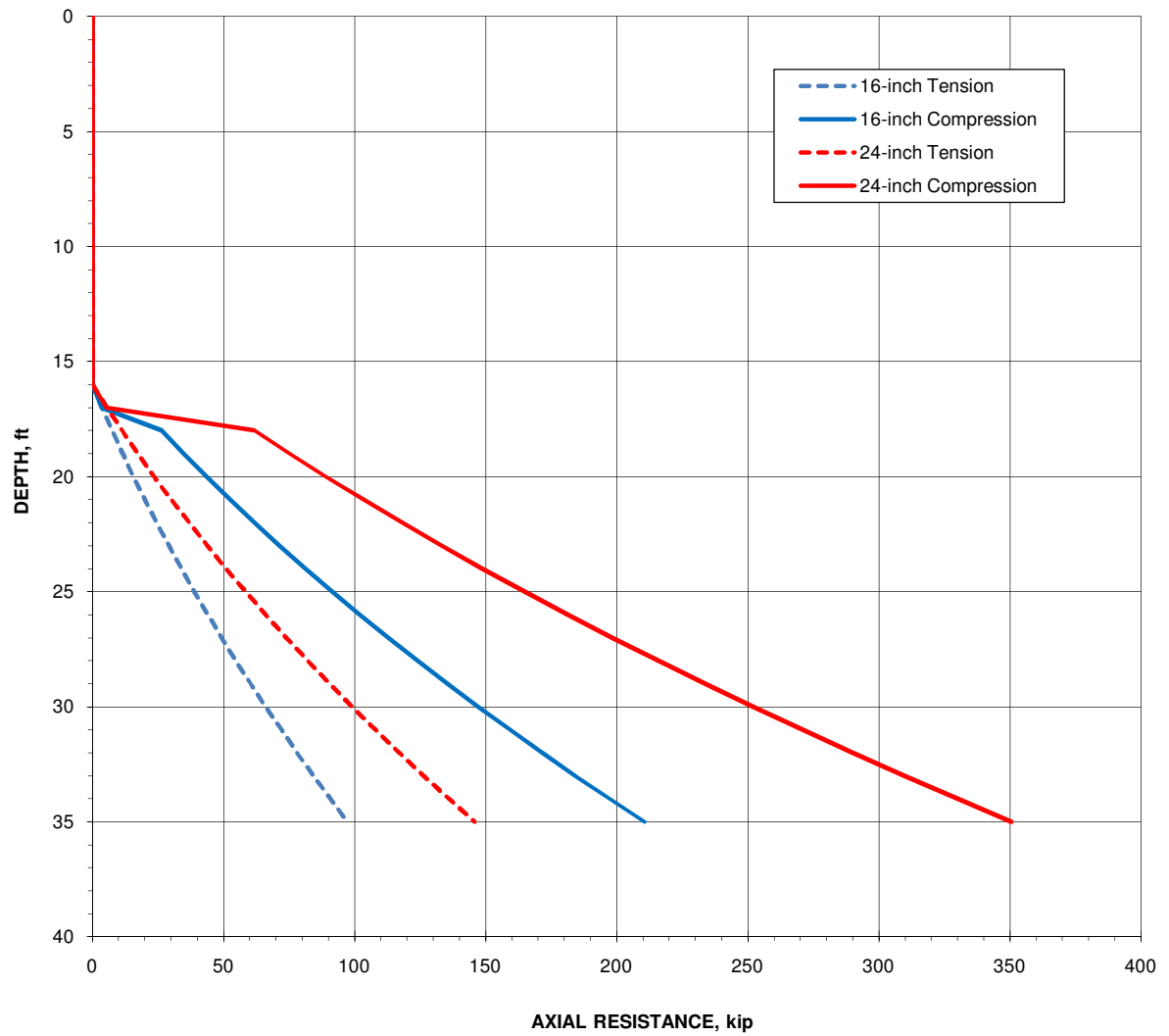
- Notes:**
1. Top of pile at ground surface
 2. Water is at 7.5 ft below ground surface
 3. Tension curves do not include the pile self-weight
 4. See report text for additional information on the use of this figure.
 5. Ultimate axial resistance shown
 6. We recommend FS=3 for allowable resistance

FIGURE **4**
AXIAL PILE RESISTANCE
ALTERNATE TANK LOCATION
STATIC CONDITIONS
 BRISTOL/UNALASKA LEACHATE TANKS/WA



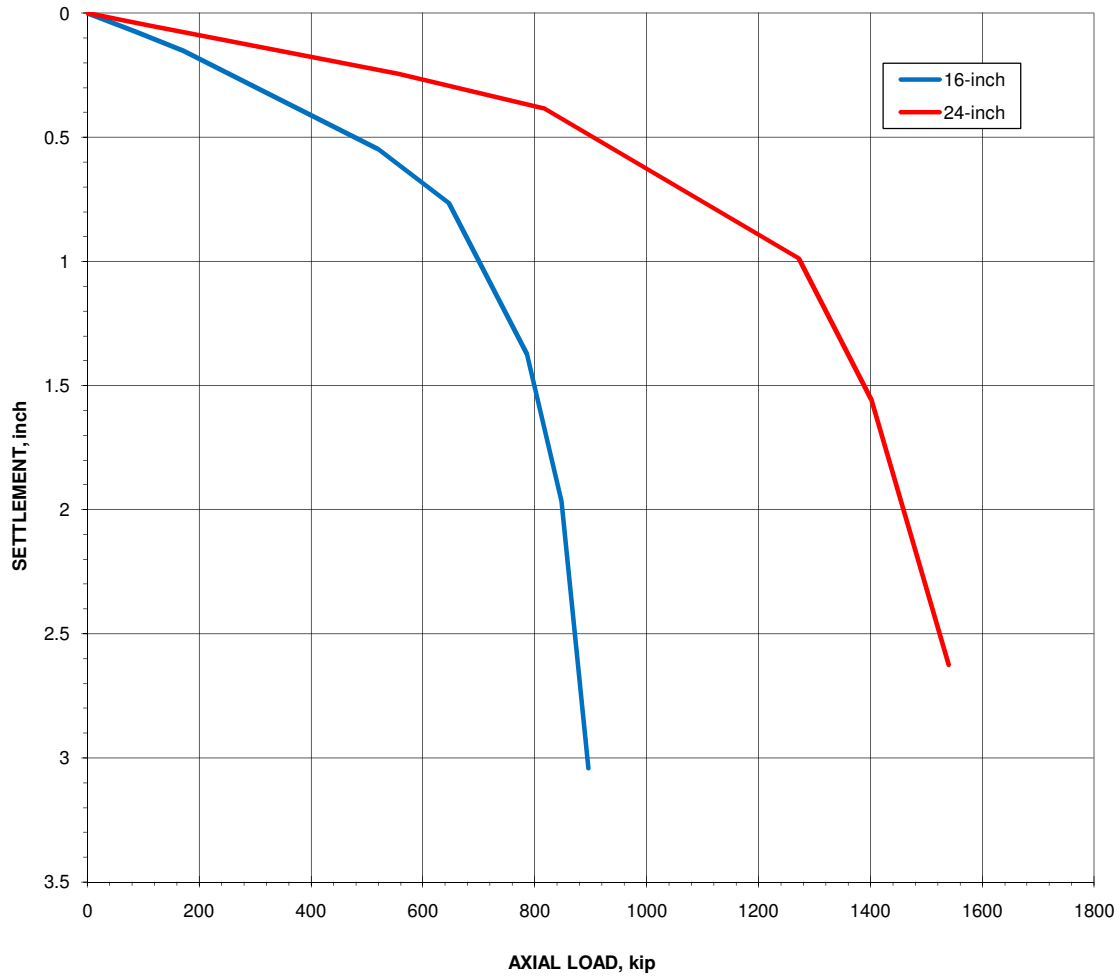
- Notes:**
1. Top of pile at ground surface
 2. Water is at 4.5 ft below ground surface
 3. Tension curves do not include the pile self-weight
 4. See report text for additional information on the use of this figure.
 5. Ultimate axial resistance shown
 6. We recommend FS=1.01 for allowable resistance

FIGURE **5**
AXIAL PILE RESISTANCE
PREFERRED TANK LOCATION
LIQUEFIED CONDITIONS
 BRISTOL/UNALASKA LEACHATE TANKS/WA



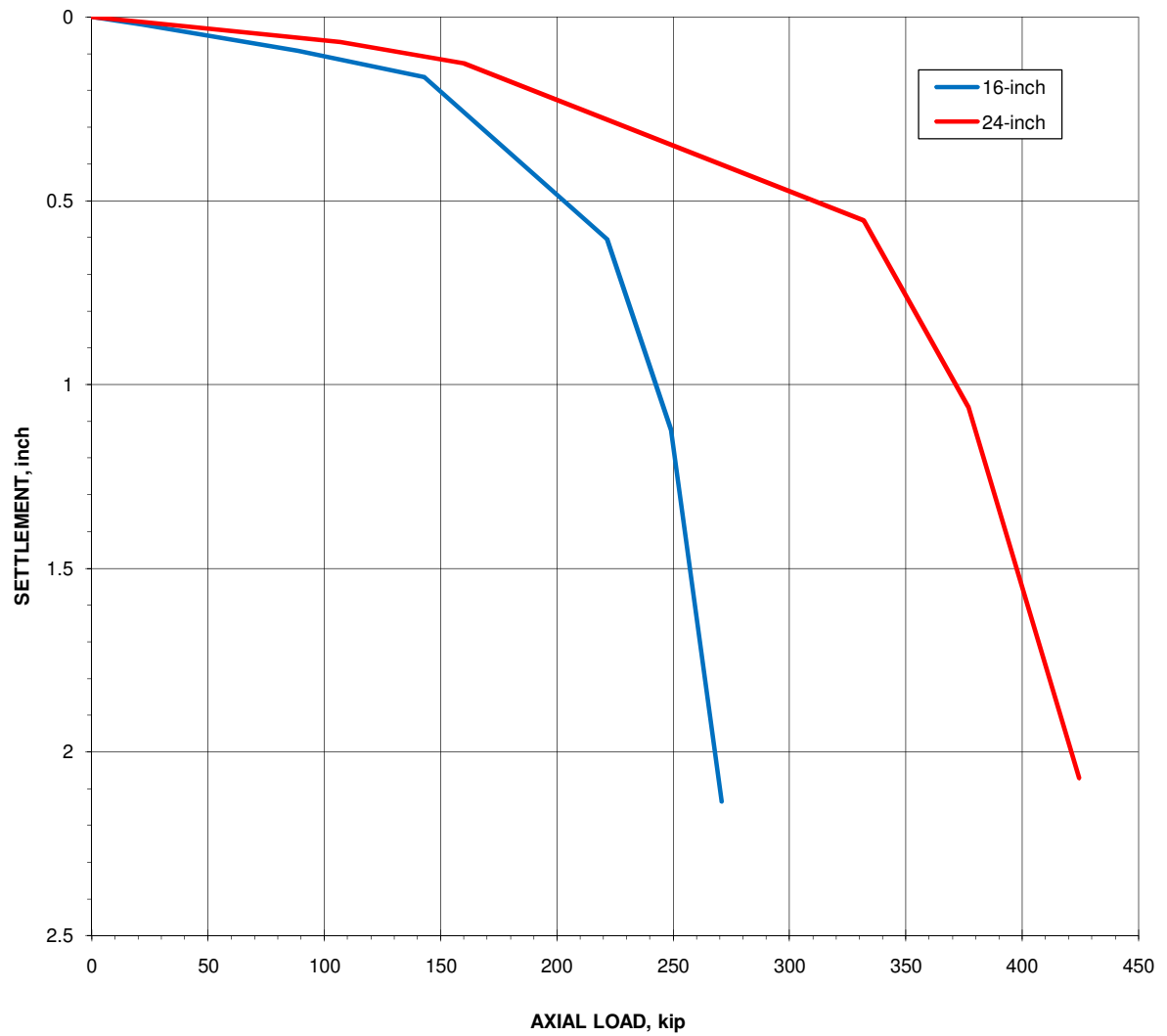
- Notes:**
1. Top of pile at ground surface
 2. Water is at 7.5 ft below ground surface
 3. Tension curves do not include the pile self-weight
 4. See report text for additional information on the use of this figure.
 5. Ultimate axial resistance shown
 6. We recommend FS=1.01 for allowable resistance

FIGURE **6**
AXIAL PILE RESISTANCE
ALTERNATE TANK LOCATION
LIQUEFIED CONDITIONS
 BRISTOL/UNALASKA LEACHATE TANKS/WA



- Notes:**
1. Top of pile at ground surface
 2. Bottom of pile at 90 ft below ground surface
 3. See report text for additional information on this figure

FIGURE **7**
AXIAL PILE SETTLEMENT
PREFERRED TANK LOCATION
 BRISTOL/UNALASKA LEACHATE TANKS/WA



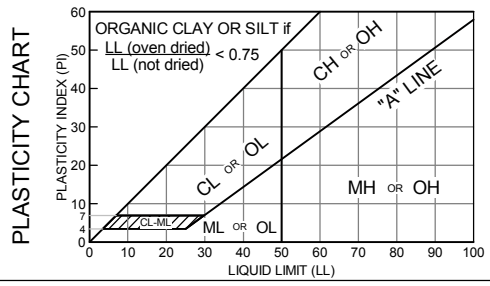
- Notes:**
1. Top of pile at ground surface
 2. Bottom of pile at 35 ft below ground surface
 3. See report text for additional information on this figure

FIGURE **8**
AXIAL PILE SETTLEMENT
ALTERNATE TANK LOCATION
 BRISTOL/UNALASKA LEACHATE TANKS/WA

APPENDIX A
SOIL CLASSIFICATION SHEET AND BOREHOLE LOGS

UNIFIED SOIL CLASSIFICATION (ASTM D 2487-00)

MATERIAL TYPES	CRITERIA FOR ASSIGNING SOIL GROUP NAMES AND GROUP SYMBOLS USING LABORATORY TESTS	GROUP SYMBOL	SOIL GROUP NAMES & LEGEND
COARSE-GRAINED SOILS >50% RETAINED ON NO. 200 SIEVE	GRAVELS >50% OF COARSE FRACTION RETAINED ON NO. 4. SIEVE	CLEAN GRAVELS <5% FINES $C_u \geq 4$ AND $1 \leq C_c \leq 3$	GW WELL-GRADED GRAVEL
		$C_u < 4$ AND/OR $1 > C_c > 3$	GP POORLY GRADED GRAVEL
		GRAVELS WITH FINES >12% FINES FINES CLASSIFY AS ML OR CL	GM SILTY GRAVEL
		FINES CLASSIFY AS CL OR CH	GC CLAYEY GRAVEL
	SANDS $\geq 50\%$ OF COARSE FRACTION PASSES ON NO. 4. SIEVE	CLEAN SANDS <5% FINES $C_u \geq 6$ AND $1 \leq C_c \leq 3$	SW WELL-GRADED SAND
		$C_u < 6$ AND/OR $1 > C_c > 3$	SP POORLY GRADED SAND
		SANDS AND FINES >12% FINES FINES CLASSIFY AS ML OR MH	SM SILTY SAND
		FINES CLASSIFY AS CL OR CH	SC CLAYEY SAND
FINE-GRAINED SOILS >50% PASSES NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT <50	CL LEAN CLAY	
		ML SILT	
	SILTS AND CLAYS LIQUID LIMIT ≥ 50	CH FAT CLAY	
		MH ELASTIC SILT	
		OH ORGANIC CLAY OR SILT	
	HIGHLY ORGANIC SOILS		PT PEAT



Gravels or sands with 5% to 12% fines require dual symbols (GW-GM, GW-GC, GP-GM, GP-GC, SW-SM, SW-SC, SP-SM, SP-SC) and add "with clay" or "with silt" to group name. If fines classify as CL-ML for GM or SM, use dual symbol GC-GM or SC-SM.

Optional Abbreviations: Lower case "s" after USCS group symbol denotes either "sandy" or "with sand" and "g" denotes either "gravelly" or "with gravel"

$$C_u = \frac{D_{60}}{D_{10}} \quad C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$$

RELATIVE DENSITY / CONSISTENCY ESTIMATE USING STANDARD PENETRATION TEST (SPT) VALUES

COHESIONLESS SOILS ^(a)		COHESIVE SOILS ^(b)		
RELATIVE DENSITY	N ₁ (BLOWS/FOOT) ^(c)	CONSISTENCY	N ₁ (BLOWS/FOOT) ^(c)	UNCONFINED COMPRESSIVE STRENGTH (TSF) ^(d)
VERY LOOSE	0 - 4	VERY SOFT	0 - 2	0 - 0.25
LOOSE	4 - 10	SOFT	2 - 4	0.25 - 0.50
COMPACT	10 - 30	FIRM	4 - 8	0.50 - 1.0
DENSE	30 - 50	STIFF	8 - 15	1.0 - 2.0
VERY DENSE	OVER 50	VERY STIFF	15 - 30	2.0 - 4.0
		HARD	OVER 30	OVER 4.0

- (a) Soils consisting of gravel, sand, and silt, either separately or in combination possessing no characteristics of plasticity, and exhibiting drained behavior.
- (b) Soils possessing the characteristics of plasticity, and exhibiting undrained behavior.
- (c) Refer to ASTM D 1586-99 for a definition of N. Values shown are based on N values corrected for overburden pressure (N₁). N values may be affected by a number of factors including material size, depth, drilling method, and borehole disturbance. N values are only an approximate guide for frozen soil or cohesive soil.
- (d) Undrained shear strength, s_u = 1/2 unconfined compression strength, U_c. Note that Torvane measures s_u and Pocket Penetrometer measures U_c.

CRITERIA FOR DESCRIBING MOISTURE CONDITION (ASTM D 2488-00)

DRY	ABSENCE OF MOISTURE, DUSTY, DRY TO THE TOUCH
MOIST	DAMP BUT NO VISIBLE WATER
WET	VISIBLE FREE WATER, USUALLY SOIL IS BELOW WATER TABLE

COMPONENT DEFINITIONS BY GRADATION

COMPONENT	SIZE RANGE
BOULDERS	ABOVE 12 IN.
COBBLES	3 IN. TO 12 IN.
GRAVEL	3 IN. TO NO. 4 (4.76 mm)
COARSE GRAVEL	3 IN. TO 3/4 IN.
FINE GRAVEL	3/4 IN. TO NO. 4 (4.76 mm)
SAND	NO. 4 (4.76 mm) TO NO. 200 (0.074 mm)
COARSE SAND	NO. 4 (4.76 mm) TO NO. 10 (2.0 mm)
MEDIUM SAND	NO. 10 (2.0 mm) TO NO. 40 (0.42 mm)
FINE SAND	NO. 40 (0.42 mm) TO NO. 200 (0.074 mm)
SILT AND CLAY	SMALLER THAN NO. 200 (0.074 mm)
SILT	0.074 mm TO 0.005 mm
CLAY	LESS THAN 0.005 mm

SAMPLER ABBREVIATIONS

SS SPT Sampler (2 in. OD, 140 lb hammer)	C Core (Rock)
SSO Oversize Split Spoon (2.5 in. OD, 140 lb typ.)	TW Thin Wall (Shelby Tube)
HD Heavy Duty Split Spoon (3 in. OD, 300/340 lb typ.)	MS Modified Shelby
BD Bulk Drive (4 in. OD, 300/340 lb hammer typ.)	GP Geoprobe
CA Continuous Core (Soil in Hollow-Stem Auger)	RC Air Rotary Cuttings
GS Grab Sample from surface / testpit	AG Auger Cuttings

DESCRIPTIVE TERMINOLOGY FOR PERCENTAGES (ASTM D 2488-00)

DESCRIPTIVE TERMS	RANGE OF PROPORTION
TRACE	0 - 5%
FEW	5 - 10%
LITTLE	10 - 25%
SOME	30 - 45%
MOSTLY	50 - 100%

LABORATORY TEST ABBREVIATIONS

Con Consolidation	PM Modified Proctor	TXCD Consolidated Drained Triaxial
Dd Dry Density	PP Pocket Penetrometer	TXCU Consolidated Undrained Triaxial
MA Sieve and Hydrometer Analysis	RD Relative Density	
NP Non-plastic	SA Sieve Analysis	TXUU Unconsolidated Undrained Triaxial
OLI Organic Loss	SpG Specific Gravity	
P200 Percent Fines (Silt & Clay)	TS Thaw Consolidation	W_c Liquid Limit (LL)
PID Photoionization Detector	TV Torvane	W_p Plastic Limit (PL)

RECORD OF BOREHOLE G10-BH01

SHEET 1 of 3

PROJECT: Unalaska Landfill Leachate Tank
 PROJECT NUMBER: 093-93387
 LOCATION: Unalaska, AK

CLIENT: BHC Consultants / Bristol Env. & Engr. DATUM: Ground Surface
 DRILLING DATES: 9/16-18/2010 ELEVATION: 8 ft
 EQUIPMENT: Mobil B-61, truck-mount COORDS: n/a

DEPTH (ft)	BORING METHOD	SOIL PROFILE				SAMPLES				UNCORRECTED BLOWS / FT			NOTES TESTS WATER LEVELS PIEZOMETER GRAPHIC					
		DESCRIPTION	ICE BOND	USCS	GRAPHIC LOG	ELEV.	NUMBER	TYPE	BLOWS per 6 in 340 lb Hammer (Cathead / Rope Method) 30 in. Drop	BLOWS PER FT	REC ATT (inch)	SALINITY (ppt) Δ						
												WATER CONTENT (PERCENT)						
0		0.0 - 0.5 Compact, moist, gray, poorly graded GRAVEL, gravel up to 0.75 inch diameter, angular gravel (GP) [FILL (D-1 SURFACE COURSE)]		GP	[GRAPHIC LOG]	0.5												
0.5 - 4.0		Compact to dense, wet, rusty orange, poorly graded GRAVEL, cobbles up to 12 inch diameter, angular cobbles, trash (e.g., plastic bags) at or near base of shot rock (GP w/ cobbles) [SHOT ROCK FILL]		GP w/ cobbles	[GRAPHIC LOG]	4.0												
4.0 - 6.0		Very soft to soft, wet, dark gray, elastic SILT with clay (MH) [LAGOON DEPOSITS]		MH	[GRAPHIC LOG]	6.0	1	HD	----	R	0/12							
6.0 - 17.5		Compact to very dense, wet, light greenish gray, poorly graded GRAVEL, trace cobbles, angular coarse sand to 2 inch gravel (GP) [BEACH COBBLE AND GRAVEL DEPOSITS]		GP	[GRAPHIC LOG]	6.0												
6 to 17.5 feet:		samples obtained may have fewer fines due to water rotary method																
17.5 feet:		easier drilling																
17.5 - 26.0		Compact, wet, brown, poorly graded SAND with silt, trace gravel up to 0.75 inch diameter, fine to medium sand (SP-SM) [BEACH SAND DEPOSITS]		SP-SM	[GRAPHIC LOG]	17.5												
26 to 27 feet:		cuttings change to more greenish tint, possible gravels encountered																
26.0 - 50.0		Compact to dense, wet, tan and light green, SILTY GRAVEL to poorly graded GRAVEL with silt and sand, subangular and subrounded gravel up to 2.5 inch diameter, trace cobbles (GM to GP-GM)		GM to GP-GM	[GRAPHIC LOG]	26.0												
10		Sample 1) Attempted at 5 feet depth but the casing was pushed to 5.5 feet depth. Sampling was attempted but upon the initial hammer blow, the casing was pushed to 6 feet depth. Sampling was stopped Sample 2) Gravel was stuck in sampler shoe probably from the beginning of sampling																
15																		
20																		
25																		
30																		
35																		
40																		

Log continued on next page

09393387 UNALASKA.GPJ LIBRARY-ANC(11-10-10).GLB [ANC BOREHOLE] E Cannon 11/11/10



DEPTH SCALE: 1 in to 5 ft
 DRILLING CONTRACTOR: Denali Drilling
 DRILLER: B. Boeller

LOGGED: E. Cannon
 CHECKED: T. Ross
 CHECK DATE: 10/6/10

Figure A-2

RECORD OF BOREHOLE G10-BH01

SHEET 2 of 3

PROJECT: Unalaska Landfill Leachate Tank
 PROJECT NUMBER: 093-93387
 LOCATION: Unalaska, AK

CLIENT: BHC Consultants / Bristol Env. & Engr. DATUM: Ground Surface
 DRILLING DATES: 9/16-18/2010 ELEVATION: 8 ft
 EQUIPMENT: Mobil B-61, truck-mount COORDS: n/a

DEPTH (ft)	BORING METHOD	SOIL PROFILE				SAMPLES				UNCORRECTED BLOWS / FT ■		NOTES TESTS WATER LEVELS PIEZOMETER GRAPHIC		
		DESCRIPTION	ICE BOND	USCS	GRAPHIC LOG	ELEV.	NUMBER	TYPE	BLOWS per 6 in 340 lb Hammer (Cathead / Rope Method) 30 in. Drop	BLOWS PER FT	REC ATT (inch)		SALINITY (ppt) Δ	
													WATER CONTENT (PERCENT)	
40	Water Rotary - 4.5-inch O.D. casing advance with tri-cone bit	26.0 - 50.0 Compact to dense, wet, tan and light green, SILTY GRAVEL to poorly graded GRAVEL with silt and sand, subangular and subrounded gravel up to 2.5 inch diameter, trace cobbles (GM to GP-GM) (Continued) Sample 2) Blow counts for second 6-inch interval not recorded	GM to GP-GM			6	HD	34--18-21	R	4/24	○	■	>>	
45														
50														
55	50 to 66 feet: poor sample recovery, attempt to wash out bottom of hole and then sample with and without check valve ball did not improve sample recovery	50.0 - 66.0 Compact, wet, light greenish gray, poorly graded SAND with silt, medium to coarse-grained sand, angular sand (SP-SM)	SP-SM		50.0	7	HD	18-13-11-10		24	2/24	○	■	
60														
65														
70	66.0 - 92.0 Compact to dense, wet, dark green, poorly graded GRAVEL with sand, gravel up to 2.5 inch diameter, trace to some cobbles, angular to subrounded gravel, black surface staining on gravel, trace shells/bones (GP w/ cobbles) [BEACH COBBLE AND GRAVEL DEPOSITS]	GP w/ cobbles		66.0	10	HD	15-10-12-13		22	11/24	○	■		
75														
80														

Log continued on next page

Backfilled with slough, cuttings, and available surface fill

09393387 UNALASKA.GPJ LIBRARY-ANC(11-10-10).GLB [ANC BOREHOLE] E Cannon 11/11/10



DEPTH SCALE: 1 in to 5 ft
 DRILLING CONTRACTOR: Denali Drilling
 DRILLER: B. Boeller

LOGGED: E. Cannon
 CHECKED: T. Ross
 CHECK DATE: 10/6/10

Figure A-2

RECORD OF BOREHOLE G10-BH01

SHEET 3 of 3

PROJECT: Unalaska Landfill Leachate Tank
 PROJECT NUMBER: 093-93387
 LOCATION: Unalaska, AK

CLIENT: BHC Consultants / Bristol Env. & Engr. DATUM: Ground Surface
 DRILLING DATES: 9/16-18/2010 ELEVATION: 8 ft
 EQUIPMENT: Mobil B-61, truck-mount COORDS: n/a

DEPTH (ft)	BORING METHOD	SOIL PROFILE				SAMPLES				UNCORRECTED BLOWS / FT ■		NOTES TESTS WATER LEVELS PIEZOMETER GRAPHIC				
		DESCRIPTION	ICE BOND	USCS	GRAPHIC LOG	ELEV.	NUMBER	TYPE	BLOWS per 6 in 340 lb Hammer (Cathead / Rope Method) 30 in. Drop	BLOWS PER FT	REC ATT (inch)		SALINITY (ppt) Δ			
													WATER CONTENT (PERCENT)			
80	Water Rotary - 4.5-inch O.D. casing advance with tri-cone bit	66.0 - 92.0 Compact to dense, wet, dark green, poorly graded GRAVEL with sand, gravel up to 2.5 inch diameter, trace to some cobbles, angular to subrounded gravel, black surface staining on gravel, trace shells/bones (GP w/ cobbles) [BEACH COBBLE AND GRAVEL DEPOSITS] (Continued)										10	20	30	40	Backfilled with slough, cuttings, and available surface fill
85												GP w/ cobbles	11	HD	26-17-16-15	
90		Sample 12) trace fine to medium grain pyrite and bivalve fossil in subrounded gravel										10	20	30	40	P200 = 3.0%
95		Borehole completed at 92.0 ft. NOTES: 1. Ground was initially excavated to approximately 10 feet depth and replaced with processed crushed rock to allow water rotary method to penetrate angular fill. Soil description in this log for this interval is based on observations during excavation 2. Groundwater measured at 5.33 feet depth (11:35 am) and 4.6 feet depth (6:02 pm) below ground surface on 9/21/2010 after completion of drilling. Low tide for the day was 1.0 feet at 11:29 am and high tide was 2.6 feet at 6:09 pm. Standpipe consisted of flushmount and 1 inch Schedule 40 PVC to a depth of 31.1 feet 3. "HD" = 3.0-inch O.D. 2.5-inch I.D. Heavy Duty split spoon sampler														
100																
105																
110																
115																
120																

09393387 UNALASKA.GPJ LIBRARY-ANC(11-10-10).GLB [ANC BOREHOLE] ECannon 11/11/10



DEPTH SCALE: 1 in to 5 ft
 DRILLING CONTRACTOR: Denali Drilling
 DRILLER: B. Boeller

LOGGED: E. Cannon
 CHECKED: T. Ross
 CHECK DATE: 10/6/10

Figure A-2

RECORD OF BOREHOLE G10-BH02

SHEET 2 of 2

PROJECT: Unalaska Landfill Leachate Tank
 PROJECT NUMBER: 093-93387
 LOCATION: Unalaska, AK

CLIENT: BHC Consultants / Bristol Env. & Engr. DATUM: Ground Surface
 DRILLING DATE: 9/19/2010 ELEVATION: 12 ft
 EQUIPMENT: Mobil B-61, truck-mount COORDS: n/a

DEPTH (ft)	BORING METHOD	SOIL PROFILE				SAMPLES				UNCORRECTED BLOWS / FT ■			NOTES TESTS WATER LEVELS PIEZOMETER GRAPHIC
		DESCRIPTION	ICE BOND	USCS	GRAPHIC LOG	ELEV. DEPTH (ft)	NUMBER	TYPE	BLOWS per 6 in 340 lb Hammer (Cathead / Rope Method) 30 in. Drop	BLOWS PER FT	REC ATT (inch)	SALINITY (ppt) Δ	
40		<p>NOTES:</p> <p>1. Ground was initially excavated to 9 to 10 feet depth and replaced with processed crushed rock to allow water rotary method to penetrate angular fill. Soil description in this log for this interval is based on observations during excavation</p> <p>2. Groundwater measured at 8.1 feet depth (11:49 am) and 7.6 feet depth (6:17 pm) below ground surface on 9/21/2010 after completion of drilling. Low tide for the day was 1.0 feet at 11:29 am and high tide was 2.6 feet at 6:09 pm. Standpipe consisted of flushmount and 1 inch Schedule 40 PVC to a depth of 35.1 feet</p> <p>3. "HD" = 3.0-inch O.D. 2.5-inch I.D. Heavy Duty split spoon sampler</p> <p>4. "RC" = Tri-cone rotary cuttings</p>											
45													
50													
55													
60													
65													
70													
75													
80													

09393387.UNALASKA.GPJ LIBRARY-ANC(11-10-10).GLB [ANC BOREHOLE] ECannon 11/11/10



DEPTH SCALE: 1 in to 5 ft
 DRILLING CONTRACTOR: Denali Drilling
 DRILLER: B. Boeller

LOGGED: E. Cannon
 CHECKED: T. Ross
 CHECK DATE: 10/6/10

Figure A-3

RECORD OF BOREHOLE G10-BH03

SHEET 1 of 2

PROJECT: Unalaska Landfill Leachate Tank
 PROJECT NUMBER: 093-93387
 LOCATION: Unalaska, AK

CLIENT: BHC Consultants / Bristol Env. & Engr.
 DRILLING DATE: 9/15/2010
 EQUIPMENT: Mobil B-61, truck-mount

DATUM: Ground Surface
 ELEVATION: 8 ft
 COORDS: n/a

DEPTH (ft)	BORING METHOD	SOIL PROFILE				SAMPLES				UNCORRECTED BLOWS / FT		NOTES TESTS WATER LEVELS GRAPHIC	
		DESCRIPTION	ICE BOND	USCS	GRAPHIC LOG	ELEV. DEPTH (ft)	NUMBER	TYPE	BLOWS per 6 in 340 lb Hammer (Cathead / Rope Method) 30 in. Drop	BLOWS PER FT	REC ATT (inch)		10 20 30 40
													WATER CONTENT (PERCENT)
0	Hollow Stem Auger	0.0 - 0.5 Compact, moist, gray, poorly graded GRAVEL, mostly angular gravel up to 0.75 inch diameter (GP) [FILL (D-1 SURFACE COURSE)]		GP	[Cross-hatch pattern]	0.5	1	AG			6	○	<p>5.25 ft 9/15/2010 4:30 pm</p> <p>Backfilled with slough, cuttings, and available surface fill</p> <p>Gravel = 2%, Sand = 91%, P200 = 7.0%</p> <p>Gravel = 56%, Sand = 35%, P200 = 9.0%</p>
0.5 - 7.5		Compact to dense, becoming loose below about 5.75 feet, wet, rusty orange, poorly graded GRAVEL, angular cobbles up to 12 inch diameter (GP w/ cobbles) [SHOT ROCK FILL]		GP w/ cobbles	[Cross-hatch pattern]		2	HD	24-7-3	10	0/18	■	
7.5 - 10.0		Very soft, moist to wet, brown, elastic SILT with clay (MH) [LAGOON DEPOSITS] Silt strata based on drilling actions and cuttings		MH	[Vertical lines pattern]	7.5						○	
10.0 - 30.0		Compact, wet, brown to dark brown, poorly graded SAND with silt and gravel, trace to few gravel up to 2 inch diameter, trace to few white shell fragments, subrounded gravel, fine to medium-grained sand, approximately 2-inch-thick clay layer within sand in upper 5 feet (SP-SM) [BEACH SAND DEPOSITS]		SP-SM	[Dotted pattern]	10.0	3	HD	7-7-11	18	14/18	○	
15							4	HD	4-8-8	16	11/18	○	
20							5	HD	3-7-8	15	22/18	○	
27.5			27.5 feet depth: increased drilling resistance followed by decreased resistance and 1 foot of heaving sands noted at 30 feet										
30.0 - 41.5		Compact to dense, wet, light and dark green and reddish brown, SILTY GRAVEL to poorly graded GRAVEL with silt and sand, angular to subrounded gravel up to 2 inch diameter, little sand (GM to GP-GM)		GM to GP-GM	[Circular patterns pattern]	30.0	6	HD	14-16-29	45	9/18	○	
35						7	HD	9-18-19	37	7/18	○		
40		Log continued on next page										○	

09393387 UNALASKA.GPJ LIBRARY-ANC(11-10-10).GLB [ANC BOREHOLE] ECannon 11/11/10



DEPTH SCALE: 1 in to 5 ft
 DRILLING CONTRACTOR: Denali Drilling
 DRILLER: B. Boeller

LOGGED: E. Cannon
 CHECKED: T. Ross
 CHECK DATE: 10/6/10

Figure A-4

RECORD OF BOREHOLE G10-BH03

SHEET 2 of 2

PROJECT: Unalaska Landfill Leachate Tank
 PROJECT NUMBER: 093-93387
 LOCATION: Unalaska, AK

CLIENT: BHC Consultants / Bristol Env. & Engr. DATUM: Ground Surface
 DRILLING DATE: 9/15/2010 ELEVATION: 8 ft
 EQUIPMENT: Mobil B-61, truck-mount COORDS: n/a

DEPTH (ft)	BORING METHOD	SOIL PROFILE				SAMPLES				UNCORRECTED BLOWS / FT ■			NOTES TESTS WATER LEVELS GRAPHIC		
		DESCRIPTION	ICE BOND	USCS	GRAPHIC LOG	ELEV.	NUMBER	TYPE	BLOWS per 6 in 340 lb Hammer (Cathead / Rope Method) 30 in. Drop	BLOWS PER FT	REC ATT (inch)	SALINITY (ppt) Δ			
												WATER CONTENT (PERCENT)			
40												10 20 30 40	10 20 30 40	W _e W _L	
41.5		Borehole completed at 41.5 ft.										10 20 30 40	10 20 30 40	W _e W _L	
45		NOTES: 1. Groundwater measured at 5.25 feet below ground surface after completion of drilling 2. "HD" = 3.0-inch O.D. 2.5-inch I.D. Heavy Duty split spoon sampler													
50												10 20 30 40	10 20 30 40	W _e W _L	
55												10 20 30 40	10 20 30 40	W _e W _L	
60												10 20 30 40	10 20 30 40	W _e W _L	
65												10 20 30 40	10 20 30 40	W _e W _L	
70												10 20 30 40	10 20 30 40	W _e W _L	
75												10 20 30 40	10 20 30 40	W _e W _L	
80												10 20 30 40	10 20 30 40	W _e W _L	

09393387 UNALASKA.GPJ LIBRARY-ANC(11-10-10).GLB [ANC BOREHOLE] ECannon 11/11/10



DEPTH SCALE: 1 in to 5 ft
 DRILLING CONTRACTOR: Denali Drilling
 DRILLER: B. Boeller

LOGGED: E. Cannon
 CHECKED: T. Ross
 CHECK DATE: 10/6/10

Figure A-4

RECORD OF BOREHOLE G10-BH04

SHEET 2 of 2

PROJECT: Unalaska Landfill Leachate Tank
 PROJECT NUMBER: 093-93387
 LOCATION: Unalaska, AK

CLIENT: BHC Consultants / Bristol Env. & Engr. DATUM: Ground Surface
 DRILLING DATE: 9/16/2010 ELEVATION: 9 ft
 EQUIPMENT: Mobil B-61, truck-mount COORDS: n/a

DEPTH (ft)	BORING METHOD	SOIL PROFILE				SAMPLES				UNCORRECTED BLOWS / FT ■		NOTES TESTS WATER LEVELS PIEZOMETER GRAPHIC		
		DESCRIPTION	ICE BOND	USCS	GRAPHIC LOG	ELEV.	NUMBER	TYPE	BLOWS per 6 in 340 lb Hammer (Cathead / Rope Method) 30 in. Drop	BLOWS PER FT	REC ATT (inch)		SALINITY (ppt) Δ	
													WATER CONTENT (PERCENT)	
40		40 feet: approximately 4 inches heave		GM to GP-GM			8	HD	13-22-19	41	12/18	○	■	Gravel = 50%, Sand = 40%, P200 = 10.0%
45		<p style="text-align: center;">Borehole completed at 41.5 ft.</p> <p>NOTES:</p> <p>1. Groundwater measured at 5.3 feet depth (11:38 am) and 5.2 feet depth (5:57 pm) below ground surface on 9/21/2010 after completion of drilling. Low tide for the day was 1.0 feet at 11:29 am and high tide was 2.6 feet at 6:09 pm. Standpipe consisted of flushmount and 0.75 inch Schedule 80 PVC to a depth of 35.25 feet</p> <p>2. Lean clay layer between 5.5 and 7.5 feet inferred based on low blow counts on second and third 6-inch interval</p> <p>3. "HD" = 3.0-inch O.D. 2.5-inch I.D. Heavy Duty split spoon sampler</p>												
50														
55														
60														
65														
70														
75														
80														

09393387 UNALASKA.GPJ LIBRARY-ANC(11-10-10).GLB [ANC BOREHOLE] ECannon 11/11/10



DEPTH SCALE: 1 in to 5 ft
 DRILLING CONTRACTOR: Denali Drilling
 DRILLER: B. Boeller

LOGGED: E. Cannon
 CHECKED: T. Ross
 CHECK DATE: 10/6/10

Figure A-5

RECORD OF BOREHOLE G10-BH05

SHEET 1 of 1

PROJECT: Unalaska Landfill Leachate Tank
 PROJECT NUMBER: 093-93387
 LOCATION: Unalaska, AK

CLIENT: BHC Consultants / Bristol Env. & Engr. DATUM: Ground Surface
 DRILLING DATE: 9/20/2010 ELEVATION: 9 ft
 EQUIPMENT: Mobil B-61, truck-mount COORDS: n/a

DEPTH (ft)	BORING METHOD	SOIL PROFILE				SAMPLES				UNCORRECTED BLOWS / FT		NOTES TESTS WATER LEVELS PIEZOMETER GRAPHIC		
		DESCRIPTION	ICE BOND	USCS	GRAPHIC LOG	ELEV.	NUMBER	TYPE	BLOWS per 6 in 340 lb Hammer (Cathead / Rope Method) 30 in. Drop	BLOWS PER FT	REC ATT (inch)		SALINITY (ppt) Δ	
													WATER CONTENT (PERCENT)	
0	Hollow Stem Auger	0.0 - 0.5 Compact, moist, gray, poorly graded GRAVEL, angular gravel up to 0.75 inch diameter (GP) [FILL (D-1 SURFACE COURSE)]		GP		0.5	1	AG			24			Flush mount metal cap Backfilled with slough, cuttings, and available surface fill 6.4 ft 9/21/2010 5:58 pm 7.8 ft 9/21/2010 11:40 am Slotted standpipe PVC Gravel = 50%, Sand = 44%, P200 = 6.0%
0.5 - 5.0		Loose to compact, moist, brown, poorly graded GRAVEL with sand, subrounded to subangular gravel up to 2 inch diameter, trace trash (plastic, metal bolt, cloth) (GP) [SHOT ROCK FILL]		GP										
5.0 - 7.5		Compact, moist, brown, poorly graded SAND with silt and gravel, fine to coarse-grained sand, little to some gravel up to 2 inch diameter, subrounded to subangular gravel (SP-SM) [POSSIBLE FILL]		SP-SM		5.0	2	HD	10-16-15-13	31	18/24			
7.5 - 10.0		Loose to compact, wet, brown, SILTY CLAY, little to some gravel up to 1.25 inch diameter, angular to subrounded gravel (CL-ML) [LAGOON DEPOSITS]		CL-ML		7.5	3	HD	7-9-11-14	20	4/24			
10.0 - 15.0		Compact, wet, grayish brown, poorly graded GRAVEL with silt and sand, fine and coarse-grained gravel up to 2 inch diameter, trace white sea shells, angular to subrounded gravel (GP-GM) [BEACH GRAVEL AND SAND DEPOSITS] 15 feet: 1 foot of heave encountered		GP-GM		10.0	4	HD	8-10-9-8	19	19/24			
15.0 - 22.0		Loose to compact, wet, brown, poorly graded SAND with silt, trace fine to coarse-grained gravel up to 2 inch diameter, fine to medium-grained sand, angular to subrounded gravel, trace white sea shells (SP-SM) [BEACH SAND DEPOSITS]		SP-SM		15.0	5	HD	3-5-4-7	9	17/24			
22.0	Borehole completed at 22.0 ft.													
25	NOTES: 1. Groundwater measured at 7.8 feet depth (11:40 am) and 6.4 feet depth (5:58 pm) below ground surface on 9/21/2010 after completion of drilling. Low tide for the day was 1.0 feet at 11:29 am and high tide was 2.6 feet at 6:09 pm. Standpipe consisted of flushmount and 1 inch Schedule 40 PVC to a depth of 15.5 feet 2. "HD" = 3.0-inch O.D. 2.5-inch I.D. Heavy Duty split spoon sampler													

09393387 UNALASKA.GPJ LIBRARY-ANC(11-10-10).GLB [ANC BOREHOLE] E Cannon 11/11/10



DEPTH SCALE: 1 in to 5 ft
 DRILLING CONTRACTOR: Denali Drilling
 DRILLER: B. Boeller

LOGGED: E. Cannon
 CHECKED: T. Ross
 CHECK DATE: 10/6/10

Figure A-6

RECORD OF BOREHOLE G10-BH06

SHEET 1 of 1

PROJECT: Unalaska Landfill Leachate Tank
 PROJECT NUMBER: 093-93387
 LOCATION: Unalaska, AK

CLIENT: BHC Consultants / Bristol Env. & Engr. DATUM: Ground Surface
 DRILLING DATE: 9/20/2010 ELEVATION: 13 ft
 EQUIPMENT: Mobil B-61, truck-mount COORDS: n/a

DEPTH (ft)	BORING METHOD	SOIL PROFILE				SAMPLES				UNCORRECTED BLOWS / FT			NOTES TESTS WATER LEVELS PIEZOMETER GRAPHIC		
		DESCRIPTION	ICE BOND	USCS	GRAPHIC LOG	ELEV. DEPTH (ft)	NUMBER	TYPE	BLOWS per 6 in 340 lb Hammer (Cathead / Rope Method) 30 in. Drop	BLOWS PER FT	REC ATT (inch)	SALINITY (ppt) Δ WATER CONTENT (PERCENT)			
												10		20	30
0	Hollow Stem Auger	0.0 - 5.0 Compact, moist, brown, poorly graded SAND with silt and gravel, trace cobbles up to 5 inch diameter, fine to coarse-grained gravel up to 2 inch diameter, subrounded cobbles, subangular and subrounded gravel, trace trash (hard plastic sheet) (SP-SM) [FILL]		SP-SM			1	AG			24	○			Covered in D-1 Surface Course Backfilled with slough, cuttings, and available surface fill 9.3 ft 9/21/2010 6:19 pm 9.5 ft 9/21/2010 11:52 am Gravel = 48%, Sand = 42%, P200 = 10.0% Slotted 1 in. PVC
5		5.0 - 7.5 Dense, moist, brown and green, poorly graded GRAVEL with silt and sand, angular gravel up to 2.5 inch diameter, trace to some cobbles (GP-GM) [POSSIBLE FILL]		GP-GM		5.0	2	HD	18-18-19-27	37	18/24	○	■		
7.5		7.5 - 15.0 Dense, moist, brown and green, poorly graded SAND with silt and gravel, trace to some cobbles, little to some gravel up to 2.5 inch diameter, subrounded to subangular gravel, mostly fine to coarse sand (SP-SM w/ cobbles) [BEACH SAND DEPOSITS]		SP-SM w/ cobbles		7.5	3	HD	14-11-21-20	32	18/24	○	■		
10		Auger grinding noise at 9 to 10 feet, then again at 13 feet continuing to bottom of hole		SP-SM w/ cobbles			4	HD	7-8-9-17	17	17/24	○	■		
15		15.0 - 25.0 Compact, wet, brown, poorly graded GRAVEL with silt and sand, angular to subrounded gravel up to 2.5 inch diameter, few to some cobbles (GP-GM w/ cobbles) [BEACH COBBLE AND GRAVEL DEPOSITS]		GP-GM w/ cobbles		15.0	5	HD	-----	R	17/24	○	■		
20		Sample 5) cobble fragments stuck in core catcher, blow counts may be elevated		GP-GM w/ cobbles			6	HD	6-9-11-11	20	12/24	○	■		
25		25.0 - 27.3 Fresh to slightly weathered (FR to SW), subhorizontal fractures, dark green, fine to medium grain, strong to very strong (R4 to R5), VOLCANIC SEDIMENTARY BEDROCK (e.g., sandstone), UNALASKA FORMATION		WBx		25.0	7	HD	35-24-25-20	49	19/24	○	■		
		Borehole completed at 27.3 ft.													
		NOTES: 1. Groundwater measured at 9.5 feet depth (11:52 am) and 9.3 feet depth (6:19 pm) below ground surface on 9/21/2010 after completion of drilling. Low tide for the day was 1.0 feet at 11:29 am and high tide was 2.6 feet at 6:09 pm. Standpipe consisted of 1 inch Schedule 40 PVC to a depth of 26.0 feet buried in gravel fill to surrounding grade 2. Sample 3): cobble may have been encountered during last 8 inches of sampling 3. "HD" = 3.0-inch O.D. 2.5-inch I.D. Heavy Duty split spoon sampler													

09393387 UNALASKA.GPJ LIBRARY-ANC(11-10-10).GLB [ANC BOREHOLE] E Cannon 11/11/10



DEPTH SCALE: 1 in to 5 ft
 DRILLING CONTRACTOR: Denali Drilling
 DRILLER: B. Boeller

LOGGED: E. Cannon
 CHECKED: T. Ross
 CHECK DATE: 10/6/10

Figure A-7

RECORD OF TEST PIT G10-TP01

SHEET 1 of 1

PROJECT: Unalaska Landfill Leachate Tank
 PROJECT NUMBER: 093-93387
 LOCATION: Unalaska, AK

CLIENT: BHC Consultants / Bristol Env. & Engr. DATUM: Ground Surface
 EXCAVATION DATE: 9/15/2010 ELEVATION: 9 ft
 EQUIPMENT: Volvo EC210CL Excavator COORDS: n/a

DEPTH (ft)	SOIL PROFILE				SAMPLES		SALINITY (ppt) Δ			NOTES TESTS WATER LEVELS	
	DESCRIPTION	ICE BOND	USCS	GRAPHIC LOG	ELEV.	NUMBER	TYPE	WATER CONTENT (PERCENT)			GRAPHIC
					DEPTH (ft)			W _s	W _c	W _L	
0	VEGETATION: None. Test pit excavated on southern edge of gravel work pad adjacent to drainage ditch.										
	0.0 - 0.5 Compact, moist, gray, poorly graded GRAVEL, gravel up to 0.75 inch diameter, angular gravel (GP) [FILL (D-1 SURFACE COURSE)]		GP		8.5	1	GS	○			
	0.5 - 5.0 Compact to dense, moist, rusty brown, poorly graded GRAVEL with silt and sand, mostly cobbles and gravel, angular gravel (GP to GP-GM, w/ cobbles) [SHOT ROCK FILL]		GP to GP-GM, w/ cobbles		0.5						
					4.0	2	GS	○			Gravel = 66%, Sand = 27%, P200 = 7.0%
5	5.0 - 7.0 Very soft, moist to wet, brown to gray, elastic SILT with clay (MH) [LAGOON DEPOSITS] Torvane = 0.7 ton/ft ² maximum shear value		MH		5.0						
					2.0	3	GS	○			Backfilled with processed crushed rock in compacted lifts
					7.0						7 ft 9/15/2010 12:00 pm, 1-5 gpm seep
					2.0	4	GS	○			Gravel = 71%, Sand = 27%, P200 = 2.0%
					7.0						
					-2.5						
	Test Pit completed at 11.5 ft.										
	NOTES: 1. Groundwater encountered at 7 feet depth as seep during excavation, estimated at 1-5 gallons per minute (gpm) 2. Lean clay layer varies in thickness from 1 to 4 feet (shown on log as 2 feet thick average thickness) 3. Beach cobble and gravel deposits sluff into test pit on all four walls below lean clay layer during excavation										

09393387 UNALASKA.GPJ LIBRARY-ANC(11-10-10).GLB [ANC TESTPIT] ECannon 11/11/10



DEPTH SCALE: 1 in to 2.5 ft
 EXCAVATION CONTRACTOR: City of Unalaska
 OPERATOR: N. Magpantay

LOGGED: E. Cannon
 CHECKED: T. Ross
 CHECK DATE: 10/6/10

Figure A-8

RECORD OF TEST PIT G10-TP02

SHEET 1 of 1

PROJECT: Unalaska Landfill Leachate Tank
 PROJECT NUMBER: 093-93387
 LOCATION: Unalaska, AK

CLIENT: BHC Consultants / Bristol Env. & Engr. DATUM: Ground Surface
 EXCAVATION DATE: 9/21/2010 ELEVATION: 12 ft
 EQUIPMENT: Volvo EC210CL Excavator COORDS: n/a

DEPTH (ft)	SOIL PROFILE				SAMPLES		SALINITY (ppt) Δ WATER CONTENT (PERCENT)				NOTES TESTS WATER LEVELS GRAPHIC	
	DESCRIPTION	ICE BOND	USCS	GRAPHIC LOG	ELEV.	NUMBER	TYPE	W _s ----- W _w				
					DEPTH (ft)			10 20 30 40				
0	VEGETATION: None. Test pit excavated off eastern edge of gravel road embankment. 0.0 - 4.0 Compact to dense, moist, rusty brown, poorly graded GRAVEL, angular gravel and cobbles, few to little subrounded cobbles up to 12 inch diameter, trace to few, fine to coarse sand; roots, white plastic, trash, and approximately 2-inch-OD metal pipe at 4 feet depth (GP w/ cobbles) [SHOT ROCK FILL]		GP w/ cobbles	[Cross-hatch pattern]	8.0 4.0	1	GS	○				
5	4.0 - 10.0 Compact to dense, moist, rusty brown, poorly graded GRAVEL, little to some cobbles, few sand, subrounded cobbles, fine to medium-grained sand, trace roots, apparent horizontal bedding (GP w/ cobbles) [BEACH COBBLE AND GRAVEL DEPOSITS]		GP w/ cobbles	[Cobble pattern]	2.0 10.0	2	GS	○				Backfilled with processed crushed rock
10	10.0 - 13.0 Compact to dense, wet, gray, poorly graded GRAVEL with sand, some to mostly cobbles, trace to few sand, subangular cobbles, fine to medium-grained sand, apparent horizontal bedding (GP w/ cobbles) [BEACH COBBLE AND GRAVEL DEPOSITS]		GP w/ cobbles	[Cobble pattern]	-1.0	3	GS	○				10 ft 9/21/2010 9:40 am, 1-5 gpm seep Gravel = 79%, Sand = 20%, P200 = 1.0%
15	Test Pit completed at 13.0 ft.											
20	NOTES: 1. Groundwater encountered at 10 feet depth as seep during excavation, estimated at 1-5 gallons per minute (gpm)											

09393387 UNALASKA.GPJ LIBRARY-ANNC(11-10-10).GLB [ANC TESTPIT] ECannon 11/11/10



DEPTH SCALE: 1 in to 2.5 ft
 EXCAVATION CONTRACTOR: City of Unalaska
 OPERATOR: N. Magpantay

LOGGED: E. Cannon
 CHECKED: T. Ross
 CHECK DATE: 10/6/10





Figure A-9

RECORD OF TEST PIT G10-TP03A

SHEET 1 of 1

PROJECT: Unalaska Landfill Leachate Tank
 PROJECT NUMBER: 093-93387
 LOCATION: Unalaska, AK

CLIENT: BHC Consultants / Bristol Env. & Engr. DATUM: Ground Surface
 EXCAVATION DATE: 9/15/2010 ELEVATION: 12 ft
 EQUIPMENT: Volvo EC210CL Excavator COORDS: n/a

DEPTH (ft)	SOIL PROFILE				SAMPLES		SALINITY (ppt) Δ				NOTES		
	DESCRIPTION	ICE BOND	USCS	GRAPHIC LOG	ELEV.	NUMBER	TYPE	WATER CONTENT (PERCENT)				TESTS	WATER LEVELS
					DEPTH (ft)			W _p	W _l	W _p	W _l		
0	VEGETATION: None. Test pit excavated off eastern edge of gravel road embankment.												
0.0 - 0.8	Compact, moist, gray, poorly graded GRAVEL with sand, subrounded gravel and cobbles up to 4 inch diameter, little cobbles, fine to coarse sand (GP) [FILL (DREDGED SEDIMENTS)]		GP		11.2 0.8	1	GS	○					
0.8 - 4.0	Compact to dense, moist, rusty brown, poorly graded GRAVEL, little to some cobbles, subrounded and subangular coarse gravel to cobbles (GP w/ cobbles) [SHOT ROCK FILL]		GP w/ cobbles			2	GS	○					
4.0 - 10.0	Compact to dense, moist, rusty brown, poorly graded GRAVEL with sand, little to mostly cobbles, subrounded cobbles (GP w/ cobbles) [BEACH COBBLE AND GRAVEL DEPOSITS]		GP w/ cobbles		8.0 4.0	3	GS	○					
10.0 - 12.0	Compact to dense, wet, gray, poorly graded GRAVEL, some to mostly cobbles, trace to few sand, subrounded cobbles, fine to medium-grained sand (GP w/ cobbles) [BEACH COBBLE AND GRAVEL DEPOSITS]		GP w/ cobbles		2.0 10.0	4	GS	○					
12.0	Test Pit completed at 12.0 ft.												
	NOTES: 1. Groundwater encountered at 10 feet depth during excavation as seep from open water in pond to the east												

Backfilled with processed crushed rock

10 ft
9/21/2010
10:55 am

09393387.UNALASKA.GPJ LIBRARY-ANC(11-10-10).GLB [ANC TESTPIT] ECannon 11/11/10



DEPTH SCALE: 1 in to 2.5 ft
 EXCAVATION CONTRACTOR: City of Unalaska
 OPERATOR: N. Magpantay

LOGGED: E. Cannon
 CHECKED: T. Ross
 CHECK DATE: 10/6/10




Figure A-10

RECORD OF TEST PIT G10-TP03B

SHEET 1 of 1

PROJECT: Unalaska Landfill Leachate Tank
 PROJECT NUMBER: 093-93387
 LOCATION: Unalaska, AK

CLIENT: BHC Consultants / Bristol Env. & Engr. DATUM: Ground Surface
 EXCAVATION DATE: 9/15/2010 ELEVATION: 5 ft
 EQUIPMENT: Volvo EC210CL Excavator COORDS: n/a

DEPTH (ft)	SOIL PROFILE				SAMPLES		SALINITY (ppt) Δ				NOTES TESTS WATER LEVELS GRAPHIC	
	DESCRIPTION	ICE BOND	USCS	GRAPHIC LOG	ELEV.	NUMBER	TYPE	WATER CONTENT (PERCENT)				
					DEPTH (ft)			W _p	W _L	W _p		W _L
0	VEGETATION: None. Test pit excavated in pond											
0.0 - 3.0	(Water) [POND]		Water									Water in pond
3.0 - 6.5	Very soft, wet, dark and light gray, elastic SILT with clay, trace roots, organic odor (MH) [LAGOON DEPOSITS]		MH		2.0 3.0	5	GS					Test pit in pond assumed to have sloughed
6.5 - 8.0	Compact to dense, wet, gray, poorly graded GRAVEL, some to mostly cobbles, trace to few sand, subrounded cobbles, fine to medium-grained sand (GP w/ cobbles) [BEACH COBBLE AND GRAVEL DEPOSITS]		GP w/ cobbles		-1.5 6.5 -3.0							
Test Pit completed at 8.0 ft.												
10												
15												
20												

09393387.UNALASKA.GPJ LIBRARY-ANC(11-10-10).GLB [ANC TESTPIT] ECannon 11/11/10



DEPTH SCALE: 1 in to 2.5 ft
 EXCAVATION CONTRACTOR: City of Unalaska
 OPERATOR: N. Magpantay

LOGGED: E. Cannon
 CHECKED: T. Ross
 CHECK DATE: 10/6/10

Figure A-11

RECORD OF TEST PIT G10-TP04

SHEET 1 of 1

PROJECT: Unalaska Landfill Leachate Tank
 PROJECT NUMBER: 093-93387
 LOCATION: Unalaska, AK

CLIENT: BHC Consultants / Bristol Env. & Engr. DATUM: Ground Surface
 EXCAVATION DATE: 9/21/2010 ELEVATION: 8 ft
 EQUIPMENT: Volvo EC210CL Excavator COORDS: n/a

DEPTH (ft)	SOIL PROFILE				SAMPLES		SALINITY (ppt) Δ WATER CONTENT (PERCENT)				NOTES TESTS WATER LEVELS GRAPHIC		
	DESCRIPTION	ICE BOND	USCS	GRAPHIC LOG	ELEV.	NUMBER	TYPE	W _p ----- W _l					
					DEPTH (ft)			-----					
0	VEGETATION: None. Test pit excavated in gravel work pad in heavy equipment storage yard. 0.0 - 0.3 Compact, moist, gray, poorly graded GRAVEL, mostly gravel up to 0.75 to 1 inch diameter, angular gravel (GP) [FILL (D-1 SURFACE COURSE)] 0.3 - 4.0 Compact to dense, moist, brown, poorly graded GRAVEL, angular-grained gravel and cobbles, roots and trash, metal at approximately 3-4 ft depth (GP w/ cobbles) [SHOT ROCK FILL]		GP	[Cross-hatched pattern]	7.7 0.3	1	GS	○					Backfilled with excavated material and processed crushed rock 4 ft 9/21/2010 1:30 pm, 1-5 gpm seep 8 ft 9/21/2010 1:45 pm, water ponding
5	4.0 - 10.0 Compact to dense, wet, gray, poorly graded GRAVEL, mostly cobbles, subrounded cobbles, apparent horizontal bedding, walls of layer sluff off during excavation (GP w/ cobbles) [BEACH COBBLE AND GRAVEL DEPOSITS]		GP w/ cobbles	[Cobble pattern]	4.0 4.0			○					
10	Test Pit completed at 10.0 ft. NOTES: 1. Groundwater encountered at 8 feet depth as seep during excavation, estimated at 1-5 gallons per minute (gpm). Water ponded at 8 feet depth.				-2.0			○					
15													
20													

09393387.UNALASKA.GPJ LIBRARY-ANC(11-10-10).GLB [ANC TESTPIT] ECannon 11/11/10



DEPTH SCALE: 1 in to 2.5 ft
 EXCAVATION CONTRACTOR: City of Unalaska
 OPERATOR: N. Magpantay

LOGGED: E. Cannon
 CHECKED: T. Ross
 CHECK DATE: 10/6/10

Figure A-12

RECORD OF TEST PIT G10-TP05

SHEET 1 of 1

PROJECT: Unalaska Landfill Leachate Tank
 PROJECT NUMBER: 093-93387
 LOCATION: Unalaska, AK

CLIENT: BHC Consultants / Bristol Env. & Engr. DATUM: Ground Surface
 EXCAVATION DATE: 9/15/2010 ELEVATION: 7 ft
 EQUIPMENT: Volvo EC210CL Excavator COORDS: n/a

DEPTH (ft)	SOIL PROFILE				SAMPLES		SALINITY (ppt) Δ				NOTES			
	DESCRIPTION	ICE BOND	USCS	GRAPHIC LOG	ELEV.	NUMBER	TYPE	WATER CONTENT (PERCENT)				TESTS	WATER LEVELS	
					DEPTH (ft)									GRAPHIC
0	VEGETATION: None. Test pit excavated on the western margin of a gravel work pad in heavy equipment storage yard.													
	0.0 - 3.0 Dense to very dense, moist, brown and gray, poorly graded GRAVEL, some to mostly cobbles, angular cobbles (GP w/ cobbles) [SHOT ROCK FILL]		GP w/ cobbles		4.0 3.0	1	GS	○						
	3.0 - 5.5 Compact to dense, moist, brown, poorly graded GRAVEL with sand and silt, little to some cobbles, trace roots, subrounded cobbles (GP-GM w/ cobbles) [BEACH COBBLE AND GRAVEL DEPOSITS]		GP-GM w/ cobbles		1.5 5.5	2	GS	○						
	5.5 - 10.0 Compact to dense, wet, gray and rusty orange, well-graded GRAVEL, some to mostly cobbles, subrounded cobbles, apparent horizontal bedding (GW w/ cobbles) [BEACH COBBLE AND GRAVEL DEPOSITS]		GW w/ cobbles		-3.0	3	GS	○						
10	Test Pit completed at 10.0 ft.													
	NOTES: 1. Groundwater encountered at 9 feet depth as seep during excavation													
15														
20														

Gravel = 52%,
 Sand = 46%,
 P200 = 2.0%

Backfilled with excavated material →

9 ft
 9/21/2010
 2:30 pm, seep

09393387 UNALASKA.GPJ LIBRARY-ANC(11-10-10).GLB [ANC TESTPIT] ECannon 11/11/10



DEPTH SCALE: 1 in to 2.5 ft
 EXCAVATION CONTRACTOR: City of Unalaska
 OPERATOR: N. Magpantay

LOGGED: E. Cannon
 CHECKED: T. Ross
 CHECK DATE: 10/6/10

Figure A-13

RECORD OF TEST PIT G10-TP06

SHEET 1 of 1

PROJECT: Unalaska Landfill Leachate Tank
 PROJECT NUMBER: 093-93387
 LOCATION: Unalaska, AK

CLIENT: BHC Consultants / Bristol Env. & Engr. DATUM: Ground Surface
 EXCAVATION DATE: 9/21/2010 ELEVATION: 6 ft
 EQUIPMENT: Volvo EC210CL Excavator COORDS: n/a

DEPTH (ft)	SOIL PROFILE				SAMPLES		SALINITY (ppt) Δ				NOTES			
	DESCRIPTION	ICE BOND	USCS	GRAPHIC LOG	ELEV.	NUMBER	TYPE	WATER CONTENT (PERCENT)				TESTS	WATER LEVELS	
					DEPTH (ft)			W_p ----- W_L 10 20 30 40				GRAPHIC		
0	0.0 - 2.0 Vegetation: Salmon berries and grass at edge of fill from powerhouse construction. Loose, moist, brown, SILT, trace roots, nonplastic (ML) [VOLCANIC ASH]		ML		4.0	1	GS						64	
5	2.0 - 7.0 Loose to compact, moist, brown, poorly graded GRAVEL with silt and sand, some to mostly cobbles, subrounded gravel and cobbles (GP-GM w/ cobbles) [BEACH COBBLE AND GRAVEL DEPOSITS]		GP-GM w/ cobbles		2.0	2	GS	○						Backfilled with excavated material 5 ft 9/21/2010 3:45 pm, seep
10	7.0 - 9.0 Compact to dense, wet, brown, poorly graded GRAVEL, some to mostly cobbles up to 9 inch diameter, subangular cobbles (GP w/ cobbles) [BEACH COBBLE AND GRAVEL DEPOSITS]		GP w/ cobbles		-1.0 7.0	3	GS	○						6.5 ft 9/21/2010 4:15 pm, water ponding
10	Test Pit completed at 9.0 ft. NOTES: 1. Groundwater encountered at 5 feet depth as seep during excavation. Water ponded at 6.5 feet depth													

09393387.UNALASKA.GPJ LIBRARY-ANC(11-10-10).GLB [ANC TESTPIT] ECannon 11/11/10



DEPTH SCALE: 1 in to 2.5 ft
 EXCAVATION CONTRACTOR: City of Unalaska
 OPERATOR: N. Magpantay

LOGGED: E. Cannon
 CHECKED: T. Ross
 CHECK DATE: 10/6/10

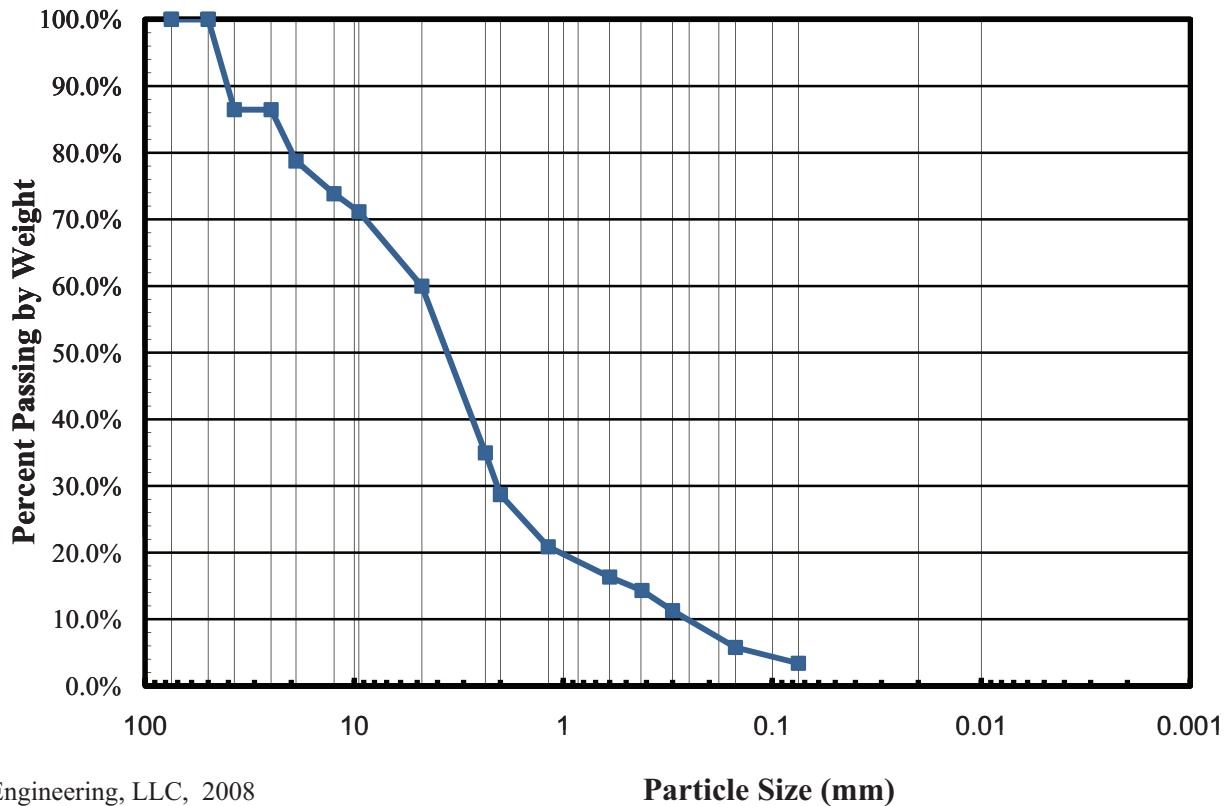
Figure A-14

APPENDIX B
LABORATORY TESTING DATA



8301 Old Seward Hwy
 Anchorage, AK 99518
 (907) 644-3923
 (907) 644-0997

Client: Golder Associates, Inc. Project: 093-93387 Unalaska Landfill Leachate Tank
 Material Description: Poorly Graded Sand with Gravel (SP)
 Sample Location: G10-BH01 Sample: 12 Depth: 90.0-92.0'



**Sieve Analysis
 ASTM C 136**

Job No. 1277
 Lab No. 822
 Received October 13, 2010
 Reported October 19, 2010

SIZE	PASSING	SPECIFICATION	
		Low	High
3"	100%		
2"	100%		
1 1/2"	86%		
1"	86%		
3/4"	79%		
1/2"	74%		
3/8"	71%		
No. 4	60%		
<hr/>			
No. 8	35%		
No. 10	29%		
No. 16	21%		
No. 30	16%		
No. 40	14%		
No. 50	11%		
No. 100	6%		
No. 200	3.4%		

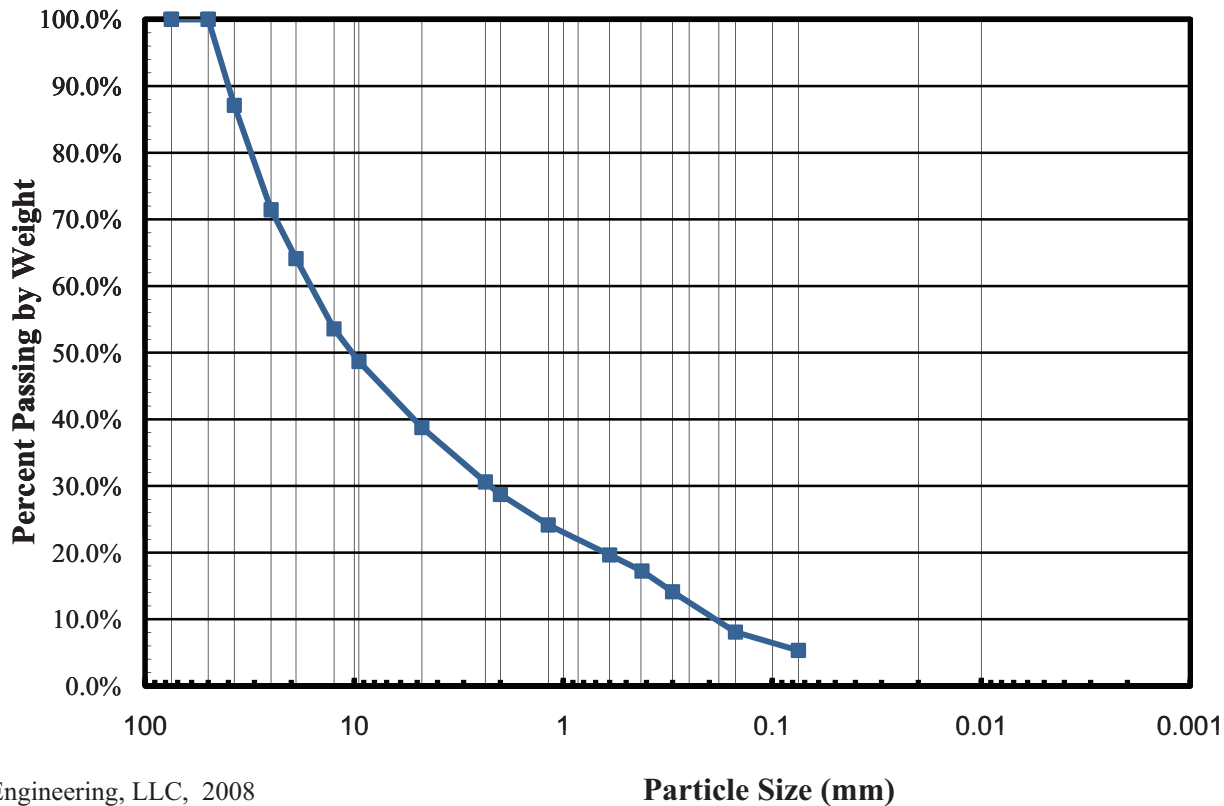
**Moisture Content As Received
 ASTM C 123**
 12.3%

Reviewed By:
 Dan Tadic, P.E.



8301 Old Seward Hwy
 Anchorage, AK 99518
 (907) 644-3923
 (907) 644-0997

Client: Golder Associates, Inc. Project: 093-93387 Unalaska Landfill Leachate Tank
 Material Description: Well Graded Gravel with Silt and Sand (GW-GM)
 Sample Location: G10-BH02 Sample: 4 Depth: 30.0-32.0'



**Sieve Analysis
 ASTM C 136**

Job No. 1277
 Lab No. 823
 Received October 13, 2010
 Reported October 20, 2010

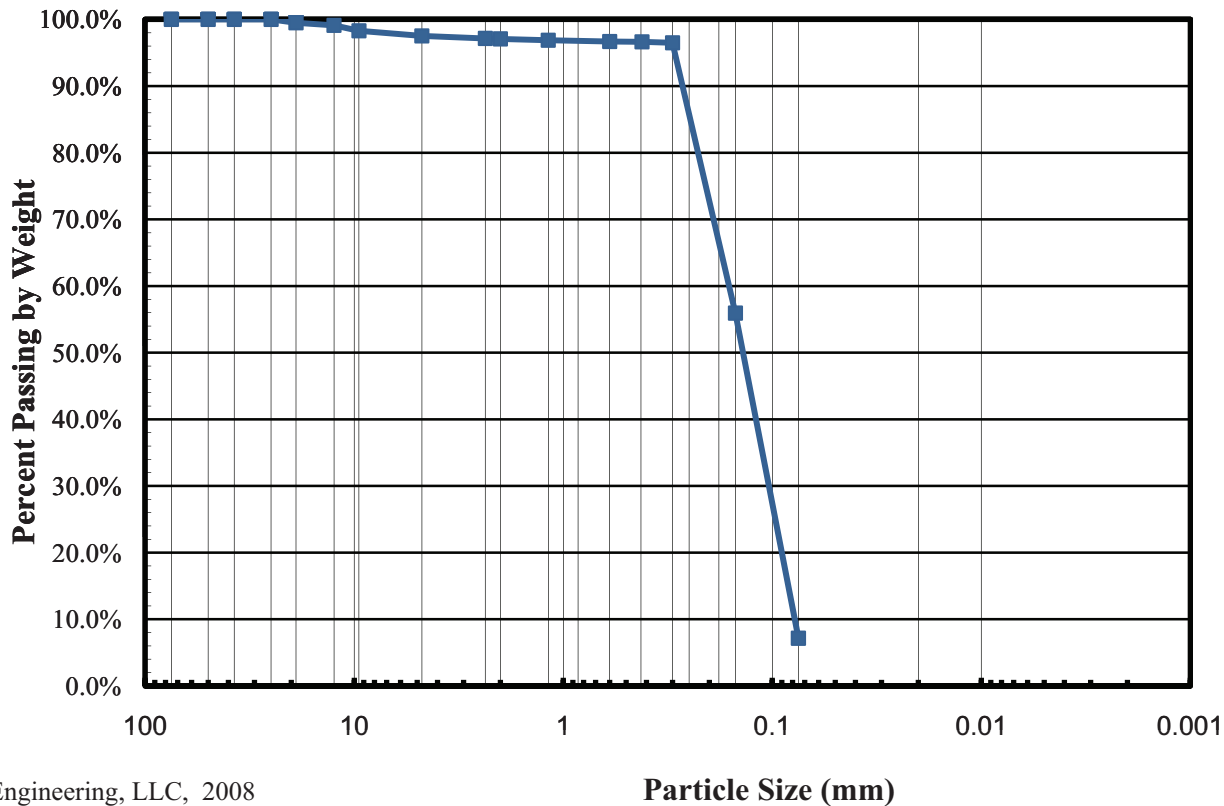
SIZE	PASSING	SPECIFICATION	
		Low	High
3"	100%		
2"	100%		
1 1/2"	87%		
1"	71%		
3/4"	64%		
1/2"	54%		
3/8"	49%		
No. 4	39%		
Moisture Content As Received			
ASTM C 123			
9.9%			

Reviewed By:
 Dan Tadic, P.E.



8301 Old Seward Hwy
 Anchorage, AK 99518
 (907) 644-3923
 (907) 644-0997

Client: Golder Associates, Inc. Project: 093-93387 Unalaska Landfill Leachate Tank
 Material Description: Poorly Graded Sand with Silt (SP-SM)
 Sample Location: G10-BH03 Sample: 5 Depth: 20.0-21.5'



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**Sieve Analysis
 ASTM C 136**

Job No. 1277
 Lab No. 824
 Received October 13, 2010
 Reported October 19, 2010

SIZE	PASSING	SPECIFICATION	
		Low	High
3"	100%		
2"	100%		
1 1/2"	100%		
1"	100%		
3/4"	100%		
1/2"	99%		
3/8"	98%		
No. 4	98%		
No. 8	97%		
No. 10	97%		
No. 16	97%		
No. 30	97%		
No. 40	97%		
No. 50	97%		
No. 100	56%		
No. 200	7.2%		

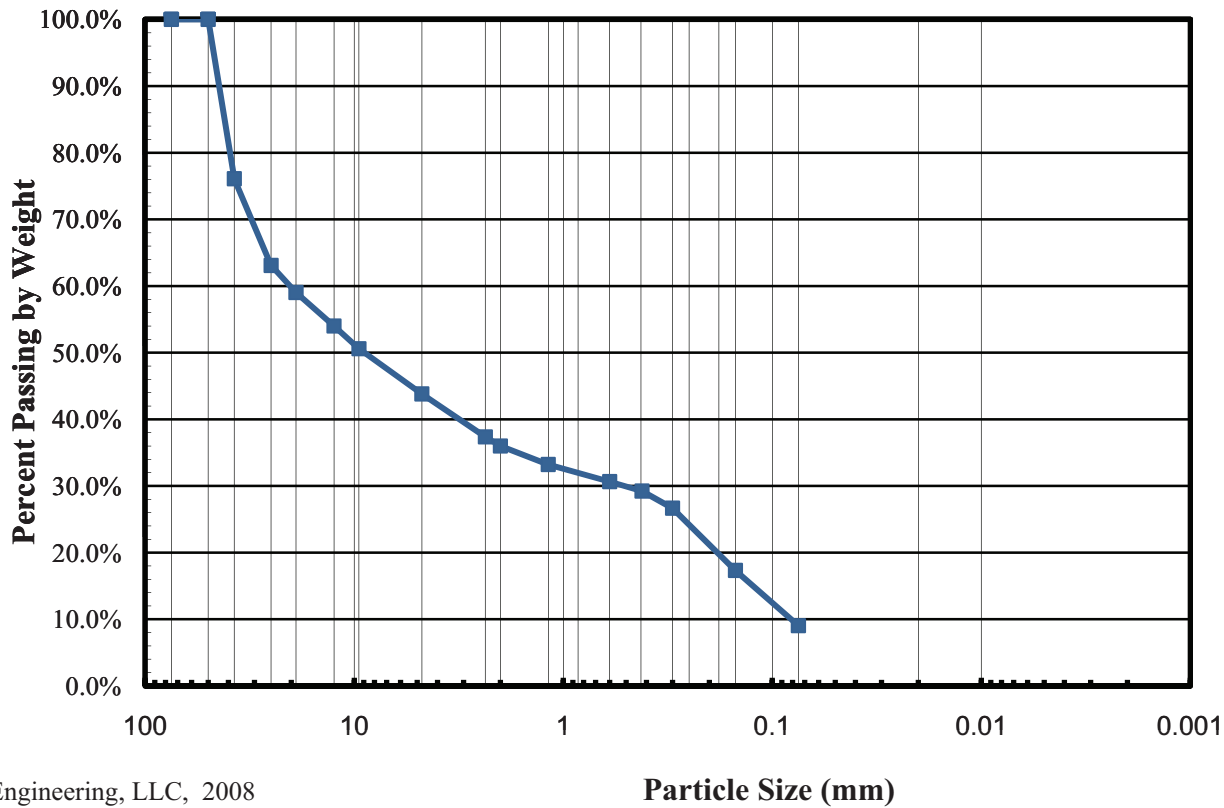
**Moisture Content As Received
 ASTM C 123**
 31.2%

Reviewed By:
 Dan Tadic, P.E.



8301 Old Seward Hwy
 Anchorage, AK 99518
 (907) 644-3923
 (907) 644-0997

Client: Golder Associates, Inc. Project: 093-93387 Unalaska Landfill Leachate Tank
 Material Description: Poorly Graded Gravel with Silt and Sand (GP-GM)
 Sample Location: G10-BH03 Sample: 6 Depth: 30.0-31.5'



**Sieve Analysis
 ASTM C 136**

Job No. 1277
 Lab No. 825
 Received October 13, 2010
 Reported October 19, 2010

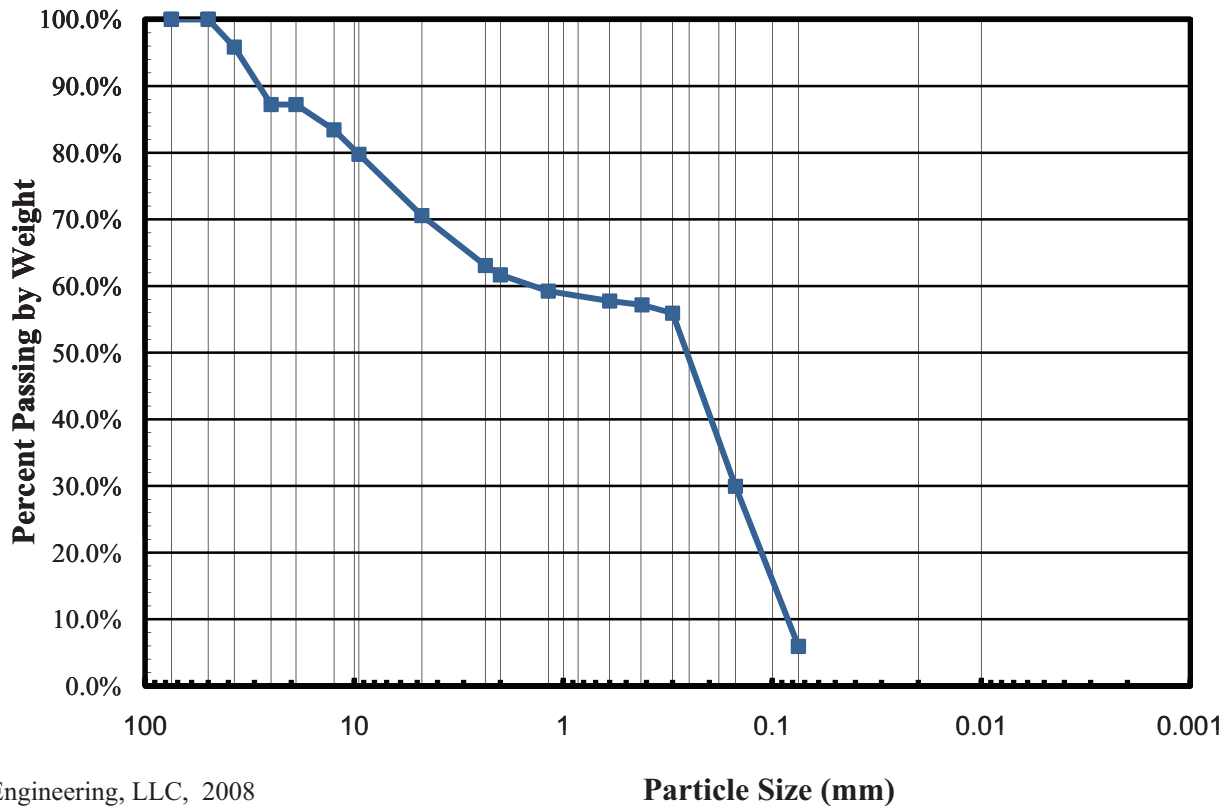
SIZE	PASSING	SPECIFICATION	
		Low	High
3"	100%		
2"	100%		
1 1/2"	76%		
1"	63%		
3/4"	59%		
1/2"	54%		
3/8"	51%		
No. 4	44%		
Moisture Content As Received			
ASTM C 123			
9.9%			

Reviewed By:
 Dan Tadic, P.E.



8301 Old Seward Hwy
 Anchorage, AK 99518
 (907) 644-3923
 (907) 644-0997

Client: Golder Associates, Inc. Project: 093-93387 Unalaska Landfill Leachate Tank
 Material Description: Poorly Graded Sand with Silt and Gravel (SP-SM)
 Sample Location: G10-BH04 Sample: 5 Depth: 15.0-16.5'



**Sieve Analysis
 ASTM C 136**

Job No. 1277
 Lab No. 827
 Received October 13, 2010
 Reported October 20, 2010

SIZE	PASSING	SPECIFICATION	
		Low	High
3"	100%		
2"	100%		
1 1/2"	96%		
1"	87%		
3/4"	87%		
1/2"	83%		
3/8"	80%		
No. 4	71%		
Moisture Content As Received			
ASTM C 123			
No. 8	63%		
No. 10	62%		
No. 16	59%		
No. 30	58%		
No. 40	57%		
No. 50	56%		
No. 100	30%		
No. 200	5.9%		

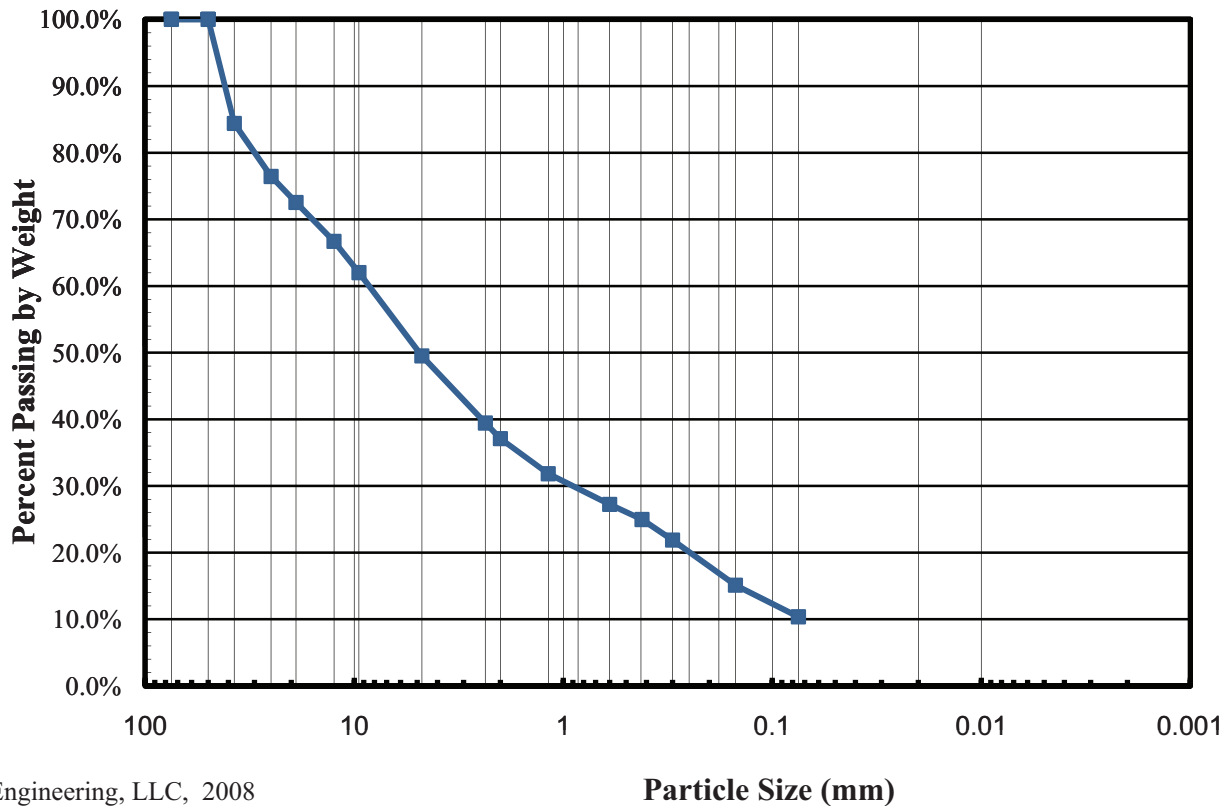
Moisture Content As Received
ASTM C 123
 20.9%

Reviewed By:
 Dan Tadic, P.E.



8301 Old Seward Hwy
Anchorage, AK 99518
(907) 644-3923
(907) 644-0997

Client: Golder Associates, Inc. Project: 093-93387 Unalaska Landfill Leachate Tank
Material Description: Poorly Graded Gravel with Silt and Sand (GP-GM)
Sample Location: G10-BH04 Sample: 8 Depth: 40.0-41.5'



**Sieve Analysis
ASTM C 136**

Job No. 1277
Lab No. 828
Received October 13, 2010
Reported October 20, 2010

SIZE	PASSING	SPECIFICATION	
		Low	High
3"	100%		
2"	100%		
1 1/2"	84%		
1"	76%		
3/4"	73%		
1/2"	67%		
3/8"	62%		
No. 4	50%		
Moisture Content As Received			
ASTM C 123			
No. 8	39%		
No. 10	37%		
No. 16	32%		
No. 30	27%		
No. 40	25%		
No. 50	22%		
No. 100	15%		
No. 200	10.4%		

**Moisture Content As Received
ASTM C 123**

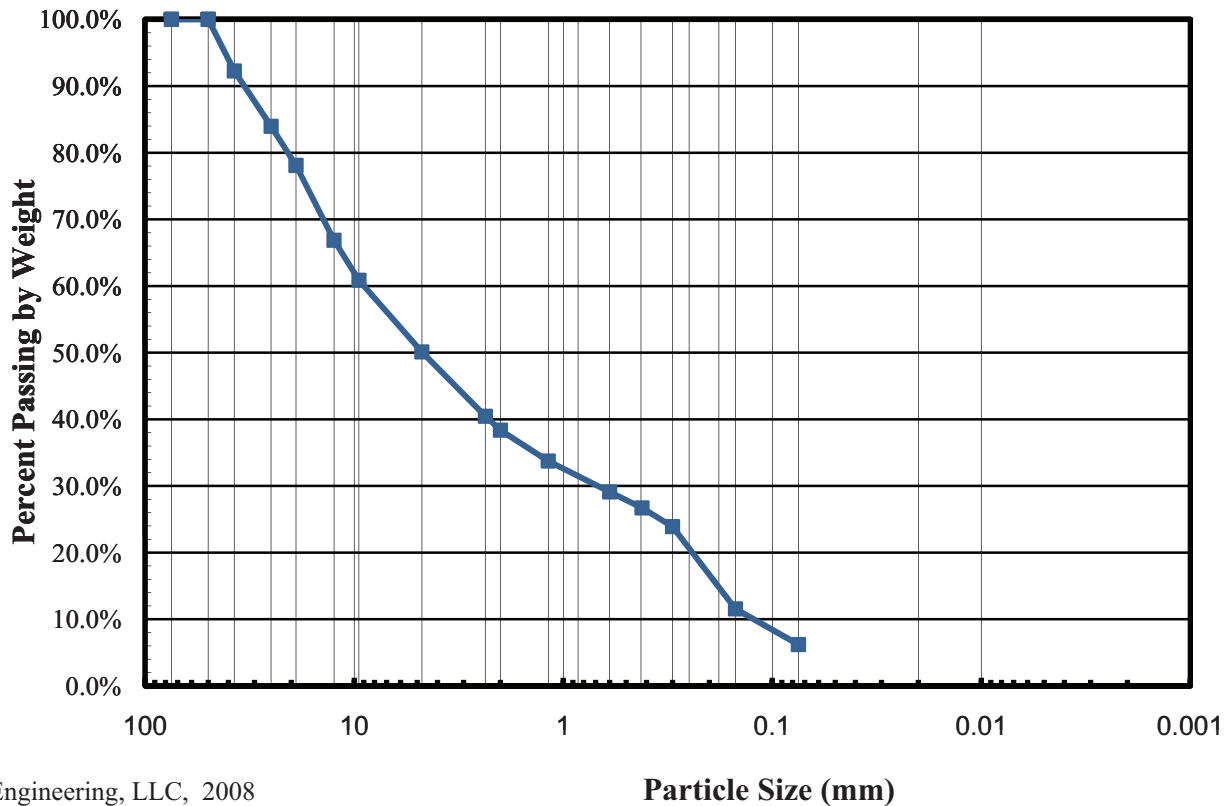
11.9%

Reviewed By:
Dan Tadic, P.E.



8301 Old Seward Hwy
 Anchorage, AK 99518
 (907) 644-3923
 (907) 644-0997

Client: Golder Associates, Inc. Project: 093-93387 Unalaska Landfill Leachate Tank
 Material Description: Poorly Graded Gravel with Silt and Sand (GP-GM)
 Sample Location: G10-BH05 Sample: 4 Depth: 10.0-12.0'



**Sieve Analysis
 ASTM C 136**

Job No. 1277
 Lab No. 830
 Received October 13, 2010
 Reported October 20, 2010

SIZE	PASSING	SPECIFICATION	
		Low	High
3"	100%		
2"	100%		
1 1/2"	92%		
1"	84%		
3/4"	78%		
1/2"	67%		
3/8"	61%		
No. 4	50%		
<hr/>			
No. 8	40%		
No. 10	38%		
No. 16	34%		
No. 30	29%		
No. 40	27%		
No. 50	24%		
No. 100	12%		
No. 200	6.2%		

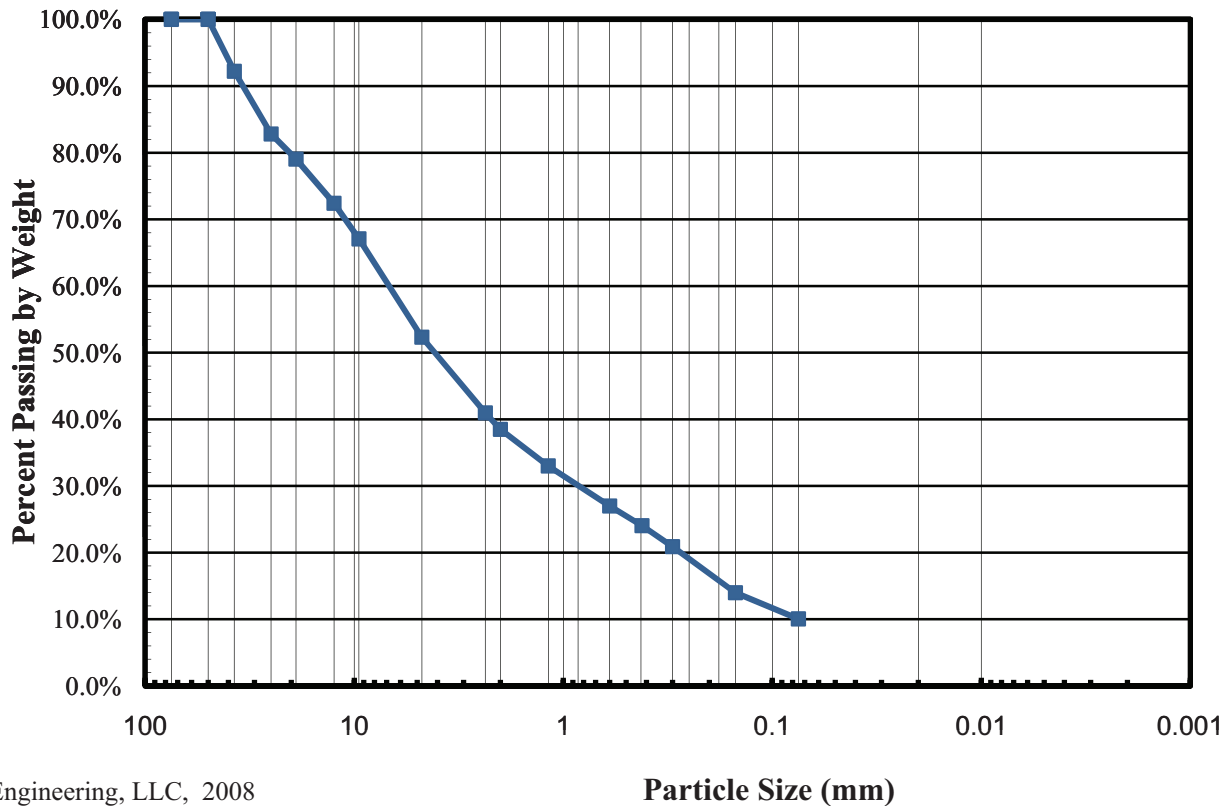
**Moisture Content As Received
 ASTM C 123**
 10.3%

Reviewed By:
 Dan Tadic, P.E.



8301 Old Seward Hwy
 Anchorage, AK 99518
 (907) 644-3923
 (907) 644-0997

Client: Golder Associates, Inc. Project: 093-93387 Unalaska Landfill Leachate Tank
 Material Description: Poorly Graded Gravel with Silt and Sand (GP-GM)
 Sample Location: G10-BH06 Sample: 5 Depth: 15.0-17.0'



**Sieve Analysis
 ASTM C 136**

Job No. 1277
 Lab No. 831
 Received October 13, 2010
 Reported October 20, 2010

SIZE	PASSING	SPECIFICATION	
		Low	High
3"	100%		
2"	100%		
1 1/2"	92%		
1"	83%		
3/4"	79%		
1/2"	72%		
3/8"	67%		
No. 4	52%		
Moisture Content As Received			
ASTM C 123			
No. 8	41%		
No. 10	39%		
No. 16	33%		
No. 30	27%		
No. 40	24%		
No. 50	21%		
No. 100	14%		
No. 200	10.1%		

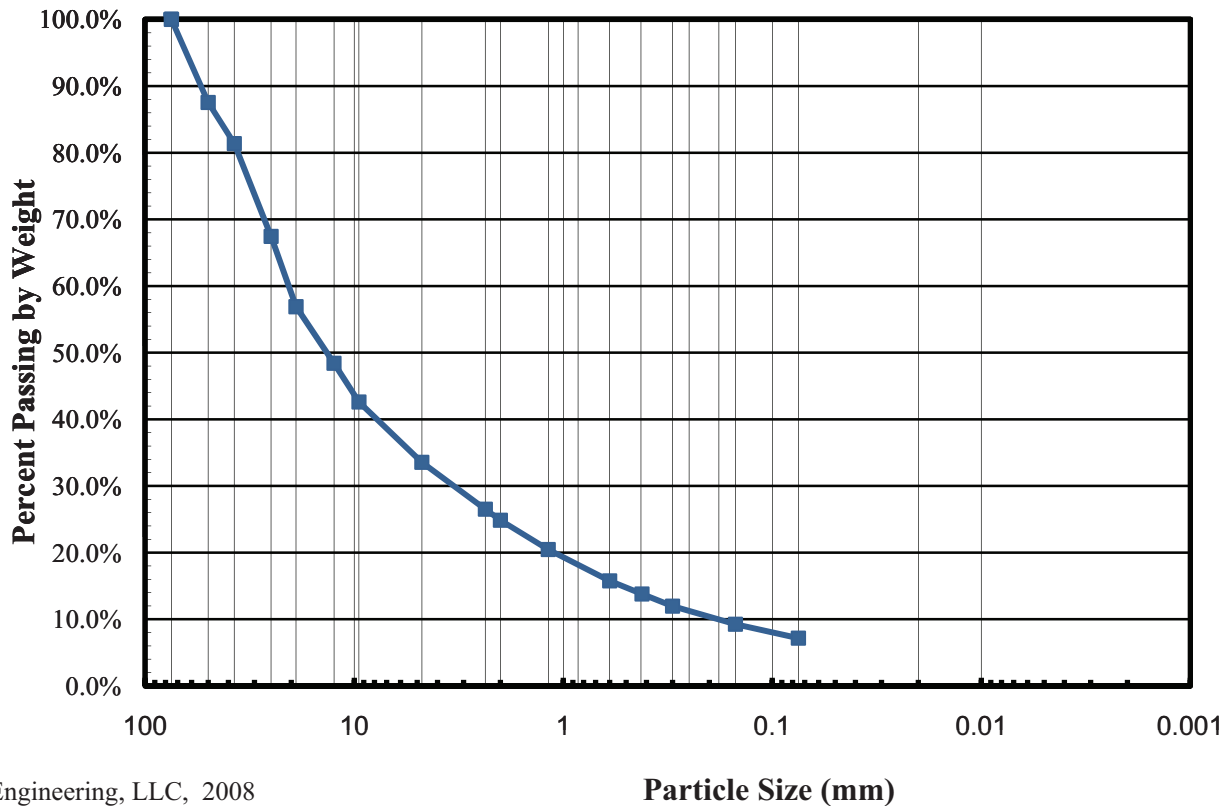
**Moisture Content As Received
 ASTM C 123**
 12.1%

Reviewed By:
 Dan Tadic, P.E.



8301 Old Seward Hwy
Anchorage, AK 99518
(907) 644-3923
(907) 644-0997

Client: Golder Associates, Inc. Project: 093-93387 Unalaska Landfill Leachate Tank
Material Description: Poorly Graded Gravel with Silt and Sand (GP-GM)
Sample Location: G10-TP01 Sample: 2 Depth: 3.0-4.0'



**Sieve Analysis
ASTM C 136**

Job No. 1277
Lab No. 832
Received October 13, 2010
Reported October 19, 2010

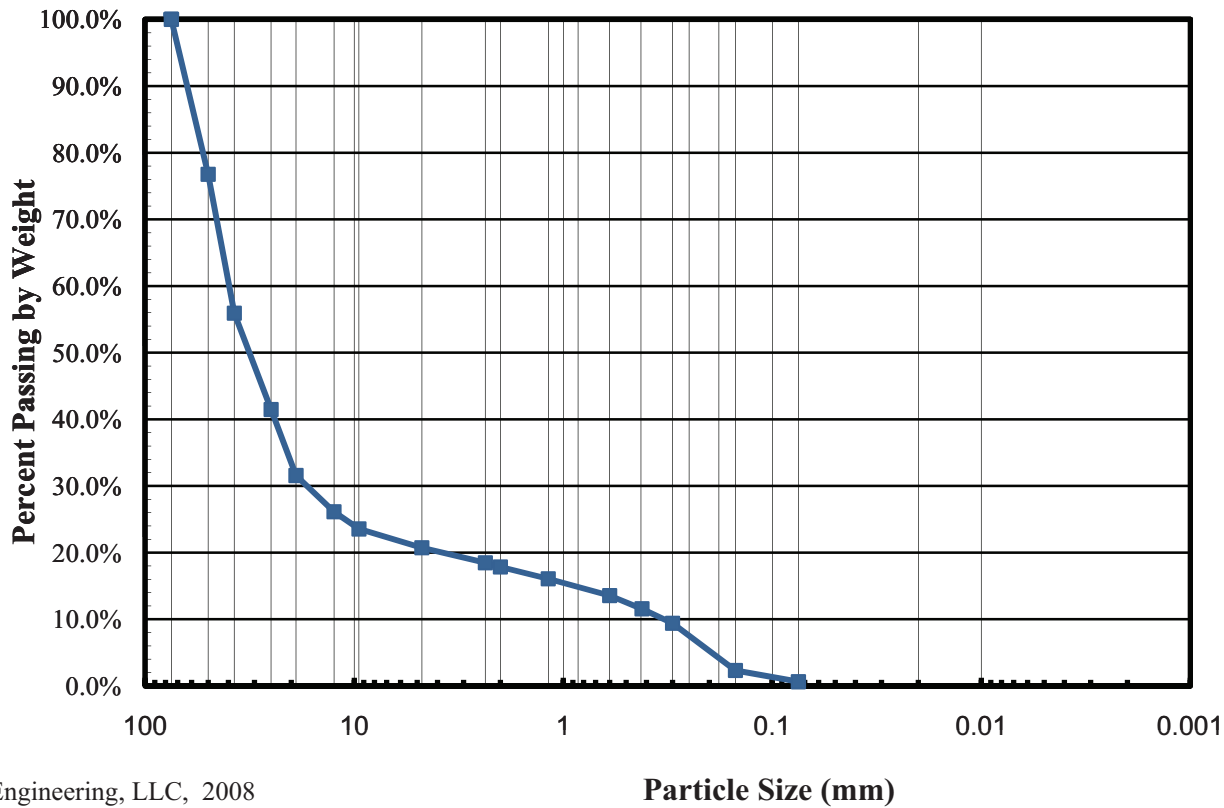
SIZE	PASSING	SPECIFICATION	
		Low	High
3"	100%		
2"	88%		
1 1/2"	81%		
1"	67%		
3/4"	57%		
1/2"	48%		
3/8"	43%		
No. 4	34%		
Moisture Content As Received			
ASTM C 123			
11.3%			

Reviewed By:
Dan Tadic, P.E.



8301 Old Seward Hwy
 Anchorage, AK 99518
 (907) 644-3923
 (907) 644-0997

Client: Golder Associates, Inc. Project: 093-93387 Unalaska Landfill Leachate Tank
 Material Description: Poorly Graded Gravel with Sand (GP)
 Sample Location: G10-TP02 Sample: 3 Depth: 10.0-13.0'



**Sieve Analysis
 ASTM C 136**

Job No. 1277
 Lab No. 835
 Received October 13, 2010
 Reported October 20, 2010

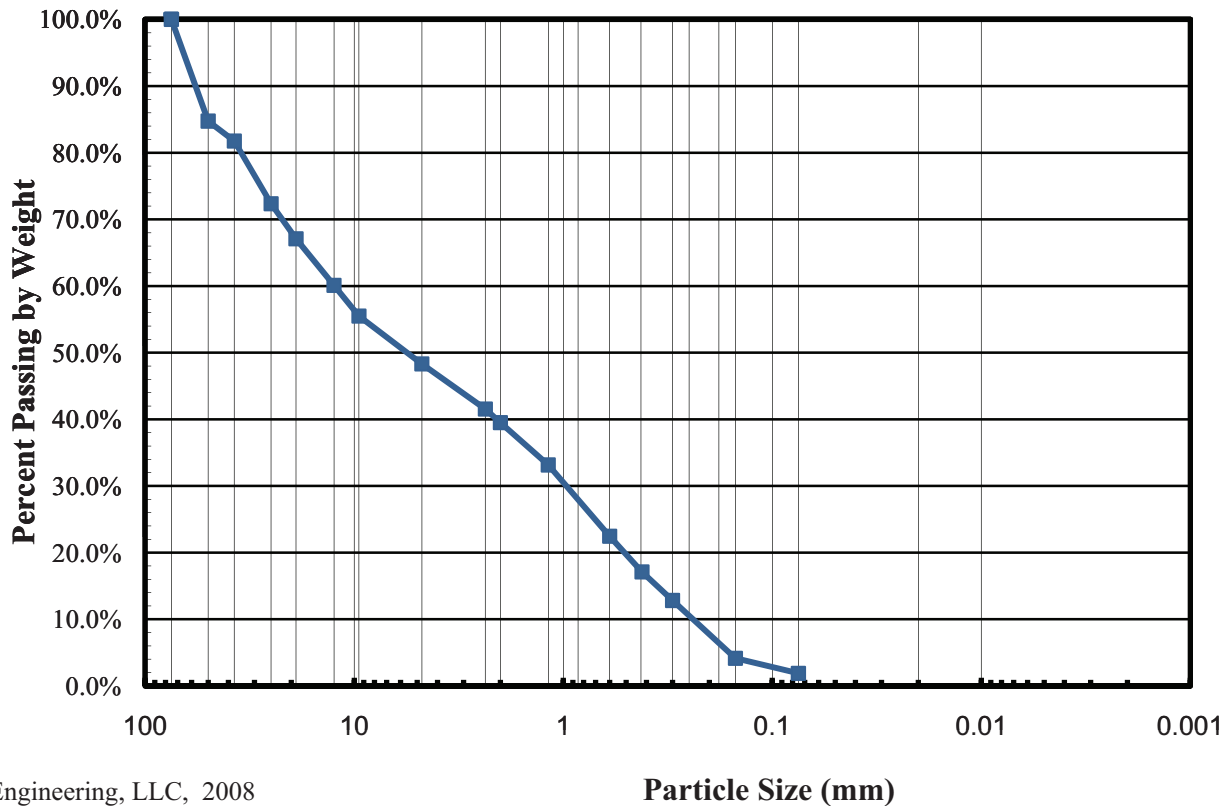
SIZE	PASSING	SPECIFICATION	
		Low	High
3"	100%		
2"	77%		
1 1/2"	56%		
1"	41%		
3/4"	32%		
1/2"	26%		
3/8"	24%		
No. 4	21%		
Moisture Content As Received			
ASTM C 123			
9.2%			

Reviewed By:
 Dan Tadic, P.E.



8301 Old Seward Hwy
 Anchorage, AK 99518
 (907) 644-3923
 (907) 644-0997

Client: Golder Associates, Inc. Project: 093-93387 Unalaska Landfill Leachate Tank
 Material Description: Well Graded Gravel with Sand (GW)
 Sample Location: G10-TP05 Sample: 3 Depth: 8.0-10.0'



**Sieve Analysis
 ASTM C 136**

Job No. 1277
 Lab No. 837
 Received October 13, 2010
 Reported October 19, 2010

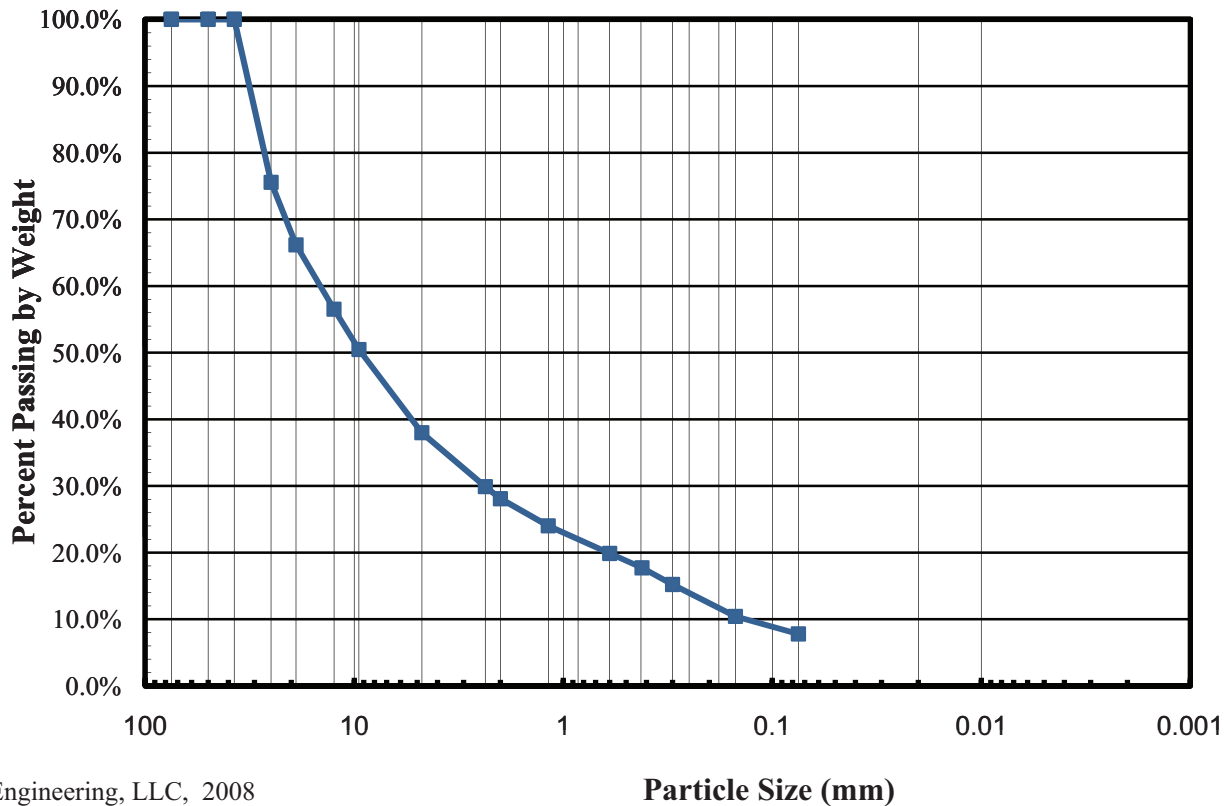
SIZE	PASSING	SPECIFICATION	
		Low	High
3"	100%		
2"	85%		
1 1/2"	82%		
1"	72%		
3/4"	67%		
1/2"	60%		
3/8"	56%		
No. 4	48%		
Moisture Content As Received			
ASTM C 123			
11.6%			

Reviewed By:
 Dan Tadic, P.E.



8301 Old Seward Hwy
 Anchorage, AK 99518
 (907) 644-3923
 (907) 644-0997

Client: Golder Associates, Inc. Project: 093-93387 Unalaska Landfill Leachate Tank
 Material Description: Poorly Graded Gravel with Silt and Sand (GP-GM)
 Sample Location: G10-BH04 Sample: 3 Depth: 7.5-9.0'



**Sieve Analysis
 ASTM C 136**

Job No. 1277
 Lab No. 826
 Received October 13, 2010
 Reported October 25, 2010

SIZE	PASSING	SPECIFICATION	
		Low	High
3"	100%		
2"	100%		
1 1/2"	100%		
1"	76%		
3/4"	66%		
1/2"	57%		
3/8"	50%		
No. 4	38%		
<hr/>			
No. 8	30%		
No. 10	28%		
No. 16	24%		
No. 30	20%		
No. 40	18%		
No. 50	15%		
No. 100	10%		
No. 200	7.8%		

**Moisture Content As Received
 ASTM C 123**
 10.7%

Reviewed By:
 Dan Tadic, P.E.

**APPENDIX C
SITE PHOTOGRAPHS**



View south-southeast along pond toward bailer facility (image from Bristol Environmental & Engineering Services Corporation, August 2010).



View east up drainage ditch at preferred tank site. Drill rig on borehole G10-BH01.



Completion of test pit G10-TP01 at 11.5 feet depth. Note horizontal, gray, high plasticity silt and clay layer in lower third of photo, underlain by “beach gravel” at bottom of test pit.



View northeast at preferred tanks site. Drill rig is on borehole G10-BH02.



Excavated site for G10-BH02, test pit is approximately 9 feet deep. Note lighter upper layer from 0 to 5 feet depth (poorly graded gravel, shot rock fill with angular blocks to 12 inch size); and lower, rusty orange/brown layer from 5 to 9 feet depth (poorly graded gravel, "beach gravels", horizontal layering, subrounded cobbles to 6 inch size).



Example of poorly graded “beach sand” (Borehole G10-BH04, Sample 6, 20 to 21.5 ft depth).



Example of poorly graded “beach cobbles and gravel” (Test Pit G10-TP06, Sample 3, 7 to 9 feet depth). Trowel is approximately 0.9 feet long.



Example of silty gravel (Borehole G10-BH01, Sample 5, 30.0 to 31.5 feet depth).

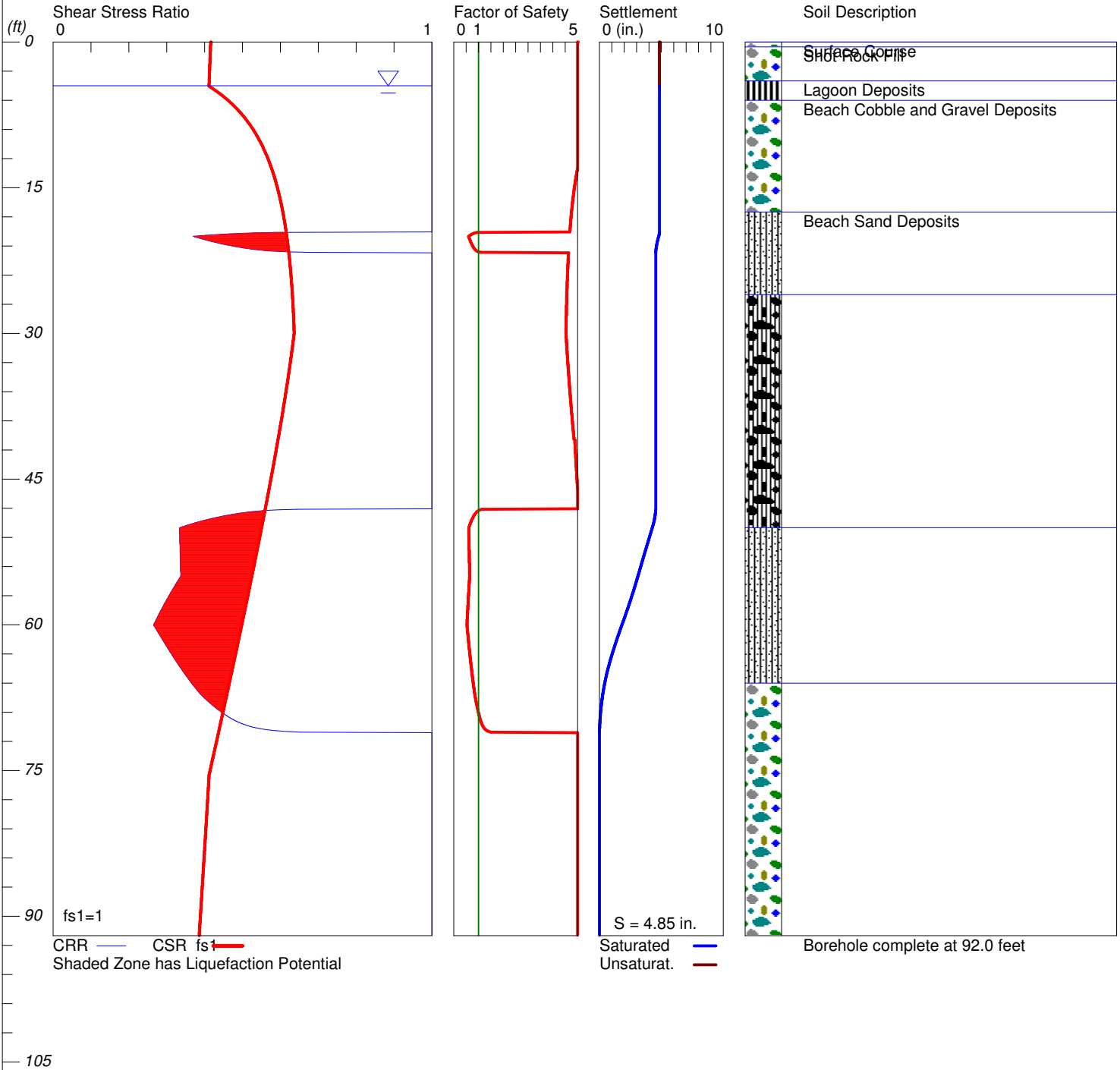
APPENDIX D
LIQUEFYPRO - LIQUEFACTION ANALYSIS OUTPUT

LIQUEFACTION ANALYSIS

Unalaska Leachate Tank

Hole No.=G10-BH01 Water Depth=4.5 ft Surface Elev.=8

Magnitude=6.5
Acceleration=0.64g



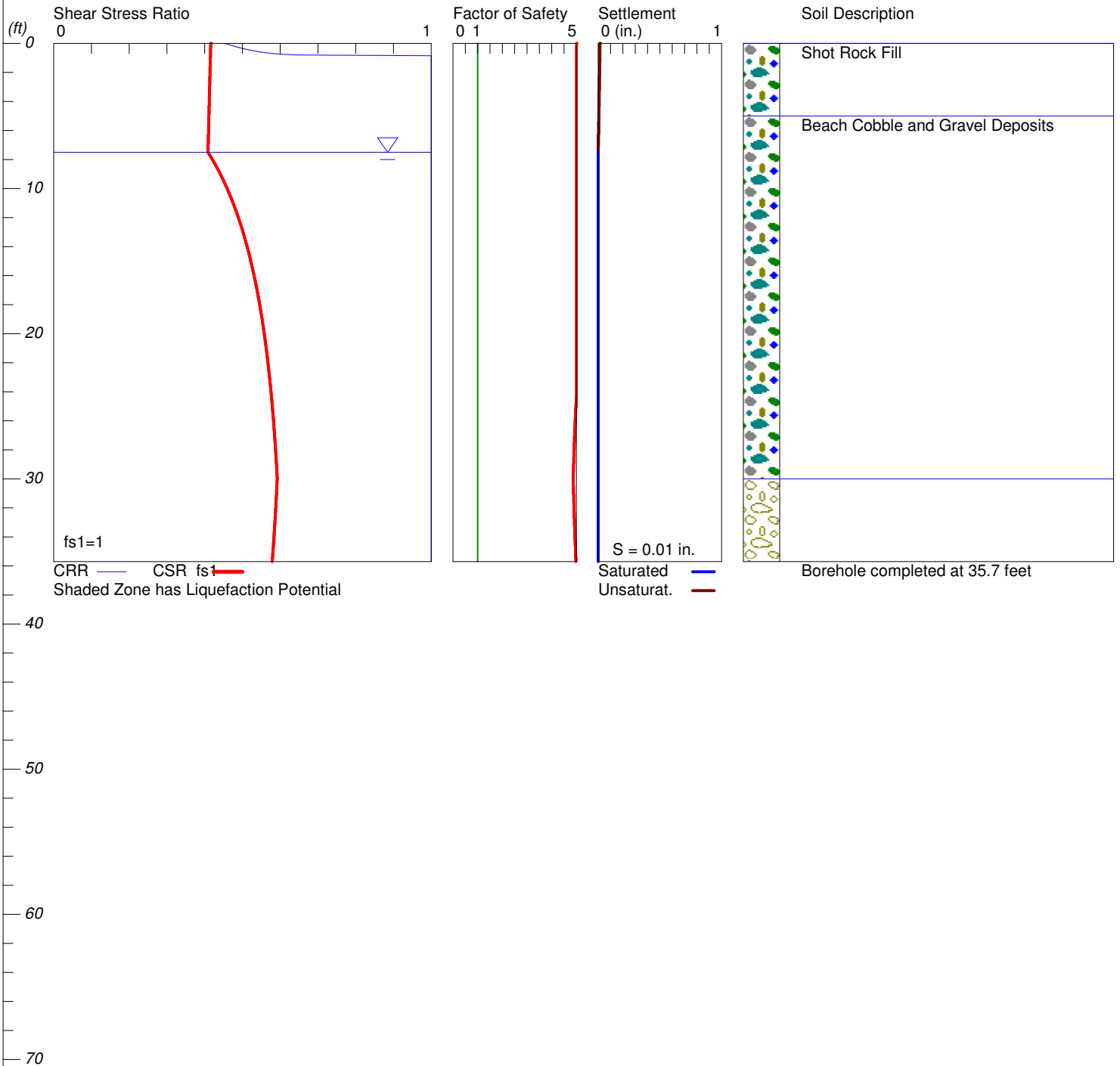
LiquefyPro CivilTech Software USA www.civilttech.com

LIQUEFACTION ANALYSIS

Unalaska Leachate Tank

Hole No.=G10-BH02 Water Depth=7.5 ft Surface Elev.=12

Magnitude=6.5
Acceleration=0.64g



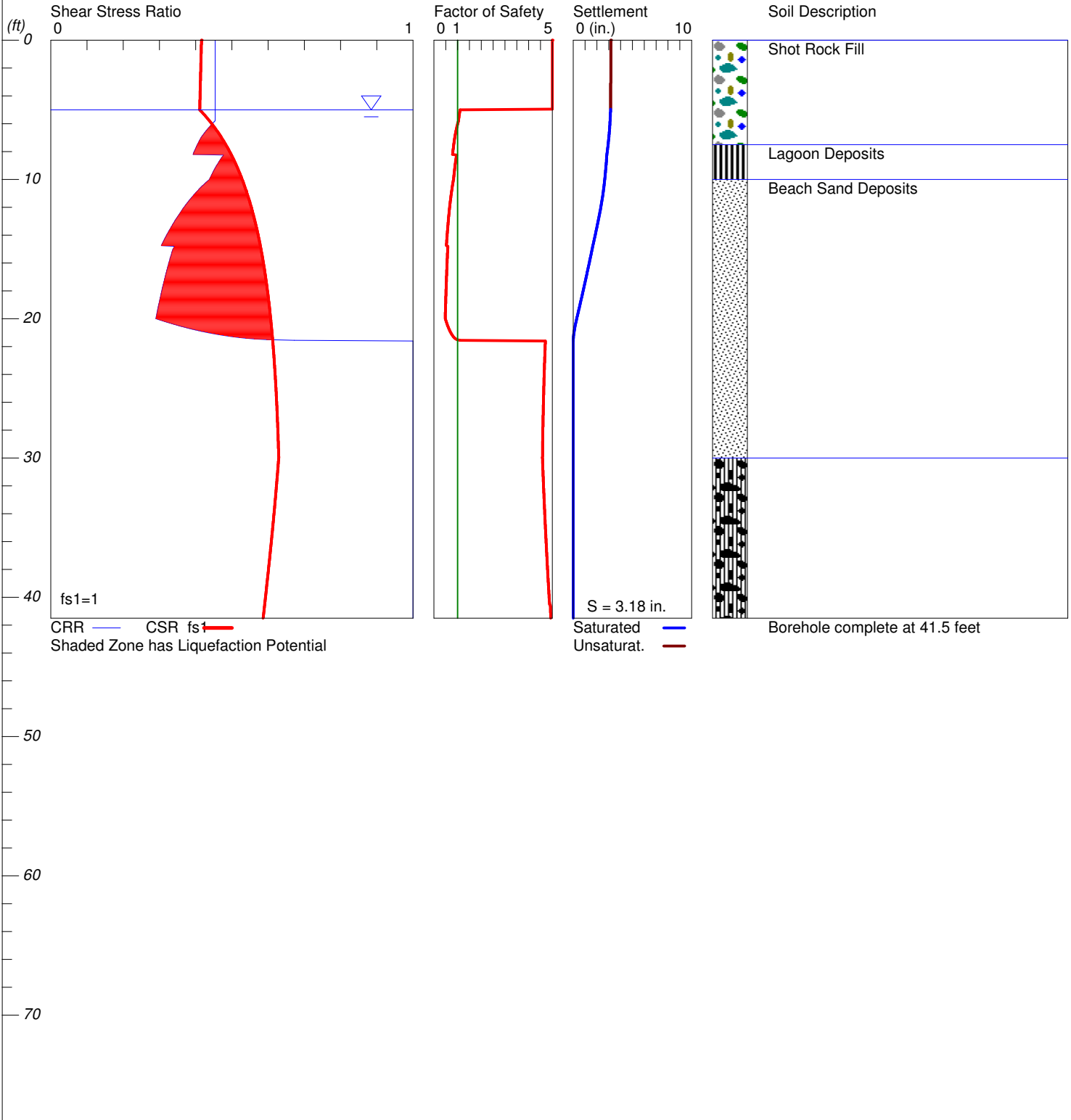
LiquefyPro CivilTech Software USA www.civilttech.com

LIQUEFACTION ANALYSIS

Unalaska Leachate Tank

Hole No.=G10-BH03 Water Depth=5 ft Surface Elev.=8

Magnitude=6.5
Acceleration=0.64g



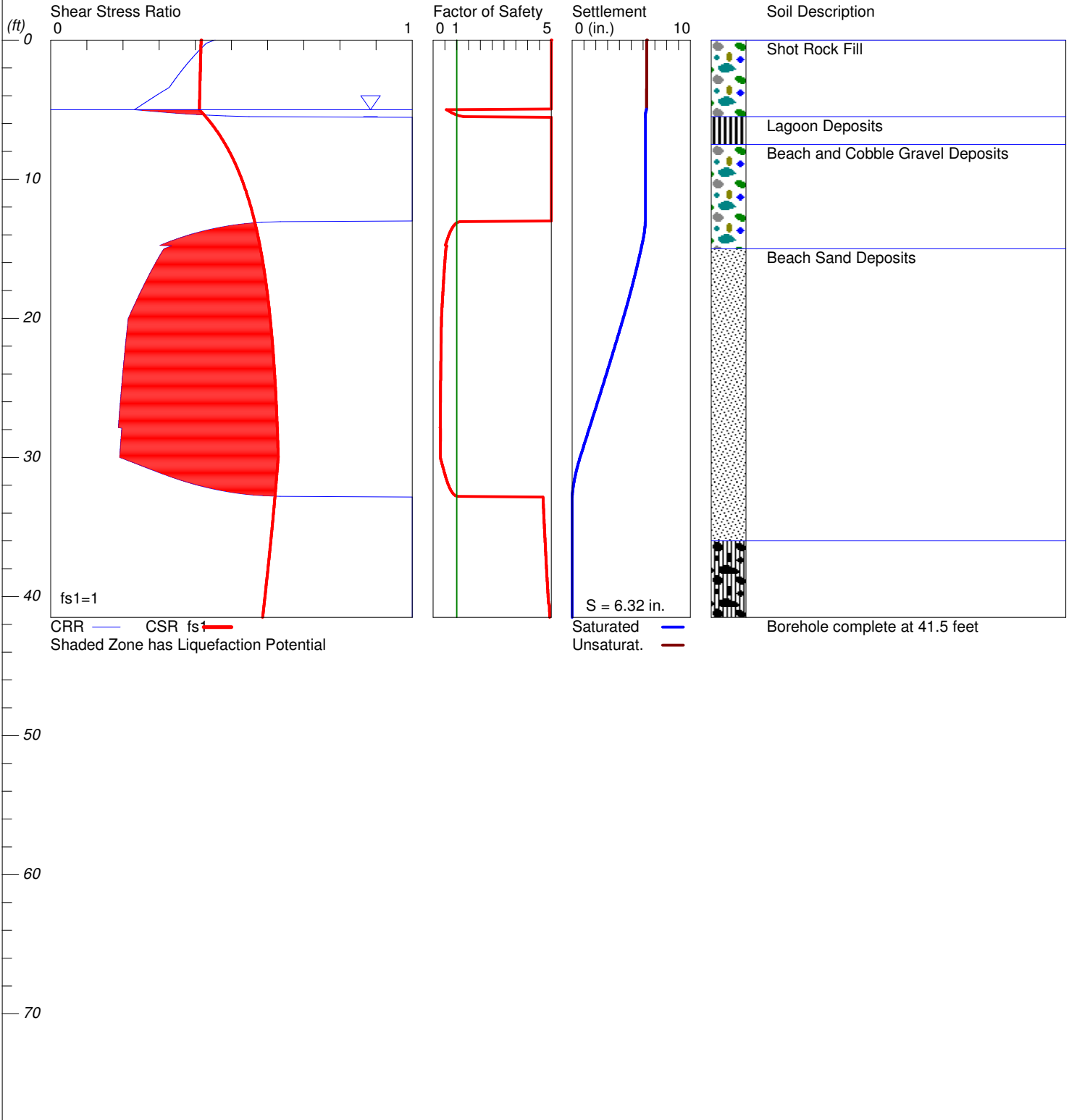
LiquefyPro CivilTech Software USA www.civilttech.com

LIQUEFACTION ANALYSIS

Unalaska Leachate Tank

Hole No.=G10-BH04 Water Depth=5 ft Surface Elev.=8

Magnitude=6.5
Acceleration=0.64g



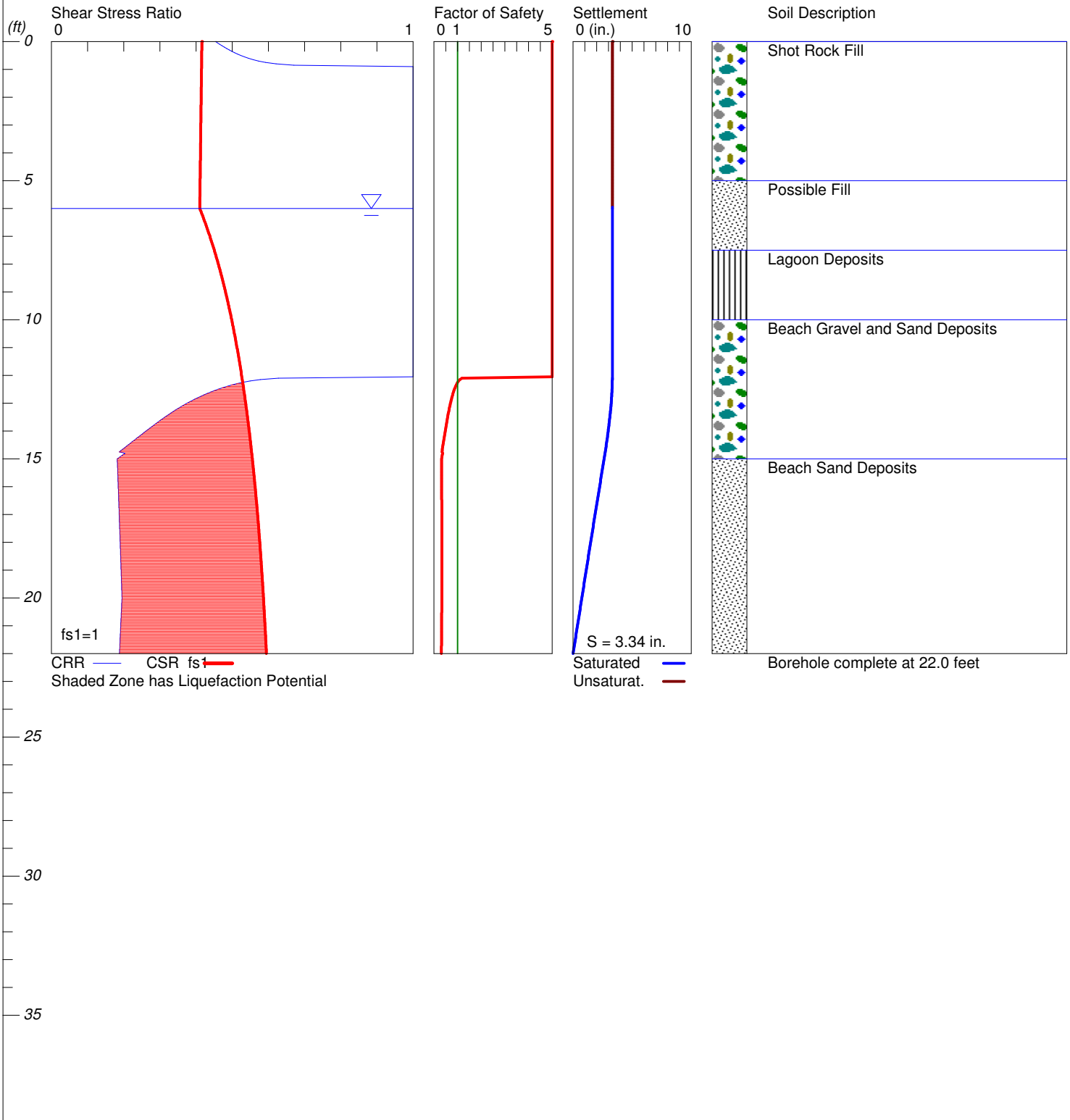
LiquefyPro CivilTech Software USA www.civilttech.com

LIQUEFACTION ANALYSIS

Unalaska Leachate Tank

Hole No.=G10-BH05 Water Depth=6 ft Surface Elev.=9

Magnitude=6.5
Acceleration=0.64g



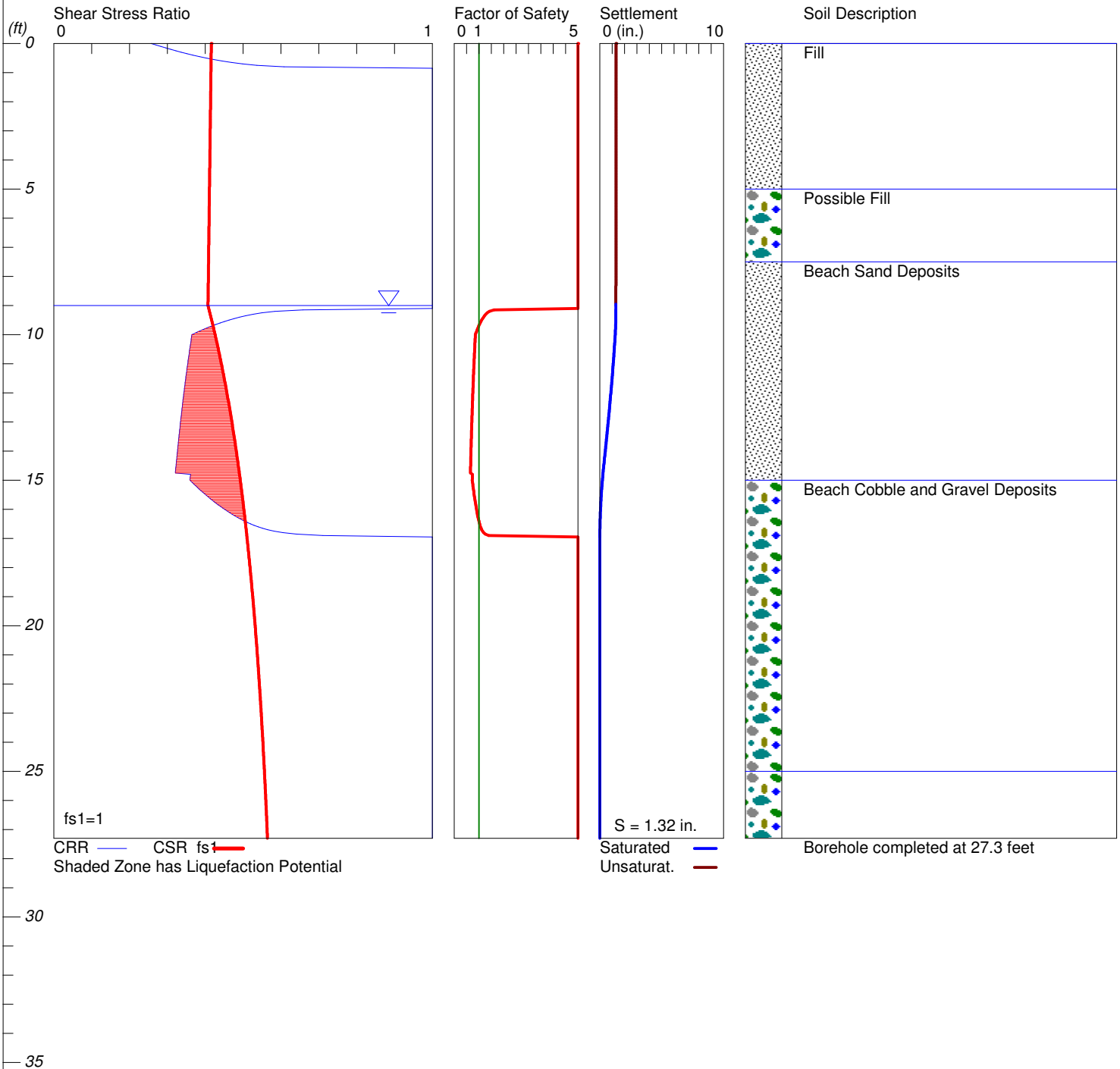
LiquefyPro CivilTech Software USA www.civilttech.com

LIQUEFACTION ANALYSIS

Unalaska Leachate Tank

Hole No.=G10-BH06 Water Depth=9 ft Surface Elev.=13

Magnitude=6.5
Acceleration=0.64g



LiquefyPro CivilTech Software USA www.civiltch.com

At Golder Associates we strive to be the most respected global group of companies specializing in ground engineering and environmental services. Employee owned since our formation in 1960, we have created a unique culture with pride in ownership, resulting in long-term organizational stability. Golder professionals take the time to build an understanding of client needs and of the specific environments in which they operate. We continue to expand our technical capabilities and have experienced steady growth with employees now operating from offices located throughout Africa, Asia, Australasia, Europe, North America and South America.

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APPENDIX B

Minimum Rates of Pay
Pamphlet 600, Issue 28
Effective April 1, 2014



Laborers' & Mechanics' Minimum Rates of Pay

Effective April 1, 2014
Issue 28

**Title 36. Public Contracts
AS 36.05 & AS 36.10
Wage & Hour Administration
Pamphlet No. 600**



**ALASKA DEPARTMENT OF LABOR
& WORKFORCE DEVELOPMENT**



THE STATE
of **ALASKA**
GOVERNOR SEAN PARNELL

**Department of Labor and
Workforce Development**

Office of the Commissioner

Post Office Box 111149
Juneau, Alaska 99811
Main: 907.465.2700
fax: 907.465-2784

April 1, 2014

TO ALL CONTRACTING AGENCIES:

At the Alaska Department of Labor and Workforce Development, our goal is putting Alaskans to work. This pamphlet is designed to help contractors awarded public construction contracts understand the most significant laws of the State of Alaska pertaining to prevailing wage and resident hire requirements.

This pamphlet identifies current prevailing wage rates and resident hire classifications for public construction contracts (any construction projects awarded by the State of Alaska or its political subdivisions, such as local governments and certain non-profit organizations).

Because these rates may change, this publication is printed in the spring and fall of every year, so please be sure you are using the appropriate rates. The rates published in this edition become effective April 1, 2014.

All projects with a final bid date of April 11, 2014, or later, must pay the prevailing wage rates contained in this pamphlet. As the law now provides, these rates will remain stable during the life of a contract or for 24 calendar months, whichever is shorter. **The date the prime contract is awarded is the date from which the 24 months will be counted.** Upon expiration of the initial 24-month period, the latest wage rates issued by the department shall become effective for a subsequent 24-month period or until the original contract is completed, whichever occurs first. This process shall be repeated until the original contract is completed.

The term "original contract", as used herein, means the signed contract that resulted from the original bid and any amendments, including changes of work scope, additions, extensions, change orders, and other instruments agreed to by the parties that have not been subject to subsequent open bid procedures.

If a higher federal rate is required due to partial federal funding or other federal participation, the higher rate must be paid.

For additional copies of this pamphlet, contact the nearest office of the Division of Labor Standards and Safety, Wage and Hour office or visit the Internet site at:

<http://labor.state.ak.us/lss/pamp600.htm>

For questions regarding prevailing wage or resident hire requirements, please contact the nearest Wage and Hour office. These offices are listed on Page xi.

Sincerely,

A handwritten signature in cursive script that reads "Dianne Blumer".
Dianne Blumer
Commissioner

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Note to Readers: The statutes and administrative regulations listed in this publication were taken from the official codes, as of the effective date of the publication. However, there may be errors or omissions that have not been identified and changes that occurred after the publication was printed. This publication is intended as an informational guide only and is not intended to serve as a precise statement of the statutes and regulations of the State of Alaska. To be certain of the current laws and regulations, please refer to the official codes.

EXCERPTS FROM ALASKA LAW

(The following statute (36.05.005) applies to projects bid on or after October 20, 2011)

Sec. 36.05.005. Applicability.

This chapter applies only to a public construction contract that exceeds \$25,000.

Sec. 36.05.010. Wage rates on public construction.

A contractor or subcontractor who performs work on a public construction contract in the state shall pay not less than the current prevailing rate of wages for work of a similar nature in the region in which the work is done. The current prevailing rate of wages is that contained in the latest determination of prevailing rate of wages issued by the Department of Labor and Workforce Development at least 10 days before the final date for submission of bids for the contract. The rate shall remain in effect for the life of the contract or for 24 calendar months, whichever is shorter. At the end of the initial 24-month period, if new wage determinations have been issued by the department, the latest wage determination shall become effective for the next 24-month period or until the contract is completed, whichever occurs first. This process shall be repeated until the contract is completed.

Sec. 36.05.040. Filing schedule of employees, wages paid, and other information.

All contractors or subcontractors who perform work on a public construction contract for the state or for a political subdivision of the state shall, before the Friday of every second week, file with the Department of Labor and Workforce Development a sworn affidavit for the previous reporting period, setting out in detail the number of persons employed, wages paid, job classification of each employee, hours worked each day and week, and other information on a form provided by the Department of Labor and Workforce Development.

Sec. 36.05.045. Notice of work and completion; withholding of payment.

- (a) Before commencing work on a public construction contract, the person entering into the contract with a contracting agency shall designate a primary contractor for purposes of this section. Before work commences, the primary contractor shall file a notice of work with the Department of Labor and Workforce Development. The notice of work must list work to be performed under the public construction contract by each contractor who will perform any portion of work on the contract and the contract price being paid to each contractor. The primary contractor shall pay all filing fees for each contractor performing work on the contract, including a filing fee based on the contract price being paid for work performed by the primary contractor's employees. The filing fee payable shall be the sum of all fees calculated for each contractor. The filing fee shall be one percent of each contractor's contract price. The total filing fee payable by the primary contractor under this subsection may not exceed \$5,000. In this subsection, "contractor" means an employer who is using employees to perform work on the public construction contract under the contract or a subcontract.
- (b) Upon completion of all work on the public construction contract, the primary contractor shall file with the Department of Labor and Workforce Development a notice of completion together with payment of any additional filing fees owed due to increased contract amounts. Within 30 days after the department's receipt of the primary contractor's notice of completion, the department shall inform the contracting agency of the amount, if any, to be withheld from the final payment.
- (c) A contracting agency
 - (1) may release final payment of a public construction contract to the extent that the agency has received verification from the Department of Labor and Workforce Development that
 - (A) the primary contractor has complied with (a) and (b) of this section;
 - (B) the Department of Labor and Workforce Development is not conducting an investigation under this title; and
 - (C) the Department of Labor and Workforce Development has not issued a notice of a violation of this chapter to the primary contractor or any other contractors working on the public construction contract; and

- (2) shall withhold from the final payment an amount sufficient to pay the department's estimate of what may be needed to compensate the employees of any contractors under investigation on this construction contract, and any unpaid filing fees.
- (d) The notice and filing fee required under (a) of this section may be filed after work has begun if
 - (1) The public construction contract is for work undertaken in immediate response to an emergency; and
 - (2) The notice and fees are filed not later than 14 days after the work has begun.
- (e) A false statement made on a notice required by this section is punishable under AS 11.56.210.

Sec. 36.05.060. Penalty for violation of this chapter.

A contractor who violates this chapter is guilty of a misdemeanor and upon conviction is punishable by a fine of not less than \$100 nor more than \$1,000, or by imprisonment for not less than 10 days nor more than 90 days, or by both. Each day a violation exists constitutes a separate offense.

Sec. 36.05.070. Wage rates in specifications and contracts for public works.

- (a) The advertised specifications for a public construction contract that requires or involves the employment of mechanics, laborers, or field surveyors must contain a provision stating the minimum wages to be paid various classes of laborers, mechanics, or field surveyors and that the rate of wages shall be adjusted to the wage rate under AS 36.05.010.
- (b) Repealed by §17 ch 142 SLA 1972.
- (c) A public construction contract under (a) of this section must contain provisions that
 - (1) the contractor or subcontractors of the contractor shall pay all employees unconditionally and not less than once a week;
 - (2) wages may not be less than those stated in the advertised specifications, regardless of the contractual relationship between the contractor or subcontractors and laborers, mechanics, or field surveyors;
 - (3) the scale of wages to be paid shall be posted by the contractor in a prominent and easily accessible place at the site of the work;
 - (4) the state or a political subdivision shall withhold so much of the accrued payments as is necessary to pay to laborers, mechanics, or field surveyors employed by the contractor or subcontractors the difference between
 - (A) the rates of wages required by the contract to be paid laborers, mechanics, or field surveyors on the work; and
 - (B) the rates of wages in fact received by laborers, mechanics, or field surveyors.

Sec. 36.05.080. Failure to pay agreed wages.

Every contract within the scope of AS 36.05.070 shall contain a provision that if it is found that a laborer, mechanic, or field surveyor employed by the contractor or subcontractor has been or is being paid a rate of wages less than the rate of wages required by the contract to be paid, the state or its political subdivision may, by written notice to the contractor, terminate the contractor's right to proceed with the work or the part of the work for which there is a failure to pay the required wages and to prosecute the work to completion by contract or otherwise, and the contractor and the contractor's sureties are liable to the state or its political subdivision for excess costs for completing the work.

Sec. 36.05.090. Payment of wages from withheld payments and listing contractors who violate contracts.

- (a) The state disbursing officer in the case of a state public construction contract and the local fiscal officer in the case of a political subdivision public construction contract shall pay directly to laborers, mechanics, or field surveyors from accrued payments withheld under the terms of the contract the wages due laborers, mechanics, or field surveyors under AS 36.05.070.
- (b) The state disbursing officer or the local fiscal officer shall distribute to all departments of the state government and to all political subdivisions of the state a list giving the names of persons who have disregarded their obligations to employees. A person appearing on this list and a firm, corporation,

partnership, or association in which the person has an interest may not work as a contractor or subcontractor on a public construction contract for the state or a political subdivision of the state until three years after the date of publication of the list. If the accrued payments withheld under the contract are insufficient to reimburse all the laborers, mechanics, or field surveyors with respect to whom there has been a failure to pay the wages required under AS 36.05.070, the laborers, mechanics, or field surveyors have the right of action or intervention or both against the contractor and the contractor's sureties conferred by law upon persons furnishing labor or materials, and in the proceedings it is not a defense that the laborers, mechanics, or field surveyors accepted or agreed to accept less than the required rate of wages or voluntarily made refunds.

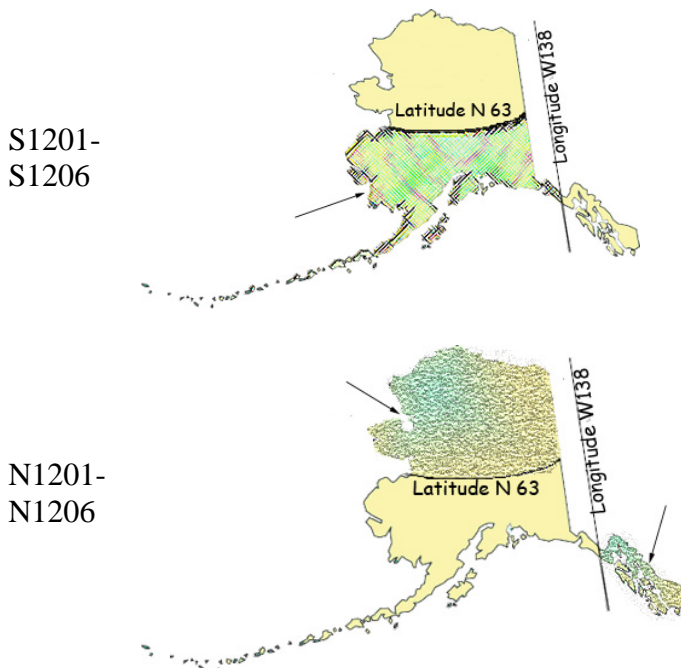
Sec. 36.05.900. Definition.

In this chapter, "contracting agency" means the state or a political subdivision of the state that has entered into a public construction contract with a contractor.

ADDITIONAL INFORMATION

LABORER CLASSIFICATION CLARIFICATION

The laborer rates categorized in class code S1201-S1206 apply in one area of Alaska; the area that is south of N63 latitude and west of W138 Longitude. The laborer rates categorized in class code N1201-N1206 apply in two areas of Alaska; the Alaska areas north of N63 latitude and east of W138 longitude. The following graphic representations should assist with clarifying the applicable wage rate categories:



ACCOMMODATIONS AND PER DIEM

The Alaska Department of Labor and Workforce Development has adopted a per diem requirement for blocklayers, bricklayers, carpenters, dredgemen, heat & frost insulators/asbestos workers, ironworkers, laborers, operative plasterers & cement masons, painters, piledrivers, power equipment operators, roofers, surveyors, truck

drivers/surveyors, and tunnel workers. This per diem rate creates an allowable alternative to providing board and lodging under the following conditions:

Employer-Provided Camp or Suitable Accommodations

Unless otherwise approved by the Commissioner, the employer shall ensure that a worker who is employed on a project that is 65 road miles or more from the international airport in either Fairbanks, Juneau or Anchorage or is inaccessible by road in a 2-wheel drive vehicle and who is not a domiciled resident of the locality of the project shall receive meals and lodging. Lodging shall be in accordance with all applicable state and federal laws. In cases where the project site is not road accessible, but the employee can reasonably get to the project worksite from their permanent residence within one hour, the Commissioner may waive these requirements for that employee upon a written request from the employer.

The term “domiciled resident” means a person living within 65 road miles of the project, or in the case of a highway project, the mid-point of the project, for at least 12 consecutive months prior to the award of the project. However, if the employer or person provides sufficient evidence to convince the department that a person has established a permanent residence and an intent to remain indefinitely within the distance to be considered a “domiciled resident,” the employer shall not be required to provide meals and lodging or pay per diem.

Where the employer provides or furnishes board, lodging or any other facility, the cost or amount thereof shall not be considered or included as part of the required prevailing wage basic hourly rate and cannot be applied to meet other fringe benefit requirements. The taxability of employer provided board and lodging shall be determined by the appropriate taxation enforcement authority.

Per Diem

Employers are encouraged to use commercial facilities and lodges; however, when such facilities are not available, per diem in lieu of meals and lodging must be paid at the basic rate of \$75.00 per day, or part thereof, the worker is employed on the project. Per diem shall not be allowed on highway projects west of Livengood on the Elliott Highway, at Mile 0 of the Dalton Highway to the North Slope of Alaska, north of Mile 20 on the Taylor Highway, east of Chicken, Alaska, on the Top of the World Highway and south of Tetlin Junction to the Alaska-Canada border.

The above-listed standards for room and board and per diem only apply to the crafts as identified in Pamphlet 600, *Laborers’ and Mechanics’ Minimum Rates of Pay*. Other crafts working on public construction projects shall be provided room and board at remote sites based on the department’s existing policy guidelines. In the event that a contractor provides lodging facilities, but no meals, the department will accept payment of \$36 per day for meals to meet the per diem requirements.

APPRENTICE HIRING REQUIREMENTS

On July 24, 2005, Administrative Order No. 226 established a 15 percent goal for hiring apprentices in certain job categories on highway, airport, harbor, dam, tunnel, utility or dredging projects awarded by the Alaska Department of Transportation and Public Facilities that exceed \$2.5 million. This Order will apply to all projects in the referenced categories that are advertised after September 1, 2005. On these projects, the hours worked by apprentices will be compared to the hours worked by journeyman level workers to determine if the 15 percent goal has been met. This on-the-job training goal is critical to ensure that the Alaska work force is prepared for the future. For additional details, contact the nearest Wage and Hour office at the address listed on Page xi of this publication. Administrative Order No. 226 may be viewed in its entirety on the Internet at <http://www.gov.state.ak.us/admin-orders/226.html> or call any Wage and Hour office to receive a copy.

APPRENTICE RATES

Apprentice rates at less than the minimum prevailing rates may be paid to apprentices according to an apprentice program which has been registered and approved by the Commissioner of the Alaska Department of Labor and Workforce Development in writing or according to a bona fide apprenticeship program registered with the U.S. Department of Labor, Office of Apprenticeship. **Any employee listed on a payroll at an apprentice wage rate who is not registered as above shall be paid the journeyman prevailing minimum wage in that work classification.** Wage rates are based on prevailing crew makeup practices in Alaska and apply to work performed regardless of either the quality of the work performed by the employee or the titles or classifications which may be assigned to individual employees.

FRINGE BENEFIT PLANS

Contractors/subcontractors may compensate fringe benefits to their employees in any one of three methods. The fringe benefits may be paid into a union trust fund, into an approved benefit plan, or paid directly on the paycheck as gross wages.

Where fringe benefits are paid into approved plans, funds, or programs including union trust funds, the payments must be contributed at least monthly. If contractors submit their own payroll forms and are paying fringe benefits into approved plans, funds, or programs, the employer's certification must include, in addition to those requirements of 8 AAC 30.020(c), a statement that fringe benefit payments have been or will be paid at least monthly. Contractors who pay fringe benefits to a plan must ensure the plan is one approved by the Internal Revenue Service and that the plan meets the requirements of 8 AAC 30.025 (eff. 3/2/08) in order for payments to be credited toward the prevailing wage obligation.

SPECIAL PREVAILING WAGE RATE DETERMINATION

Special prevailing wage rate determinations may be requested for special projects or a special worker classification if the work to be performed does not conform to traditional public construction for which a prevailing wage rate has been established under 8 AAC 30.050(a) of this section. Requests for special wage rate determinations must be in writing and filed with the Commissioner at least 30 days before the award of the contract. An applicant for a special wage rate determination shall have the responsibility to support the necessity for the special rate. An application for a special wage rate determination filed under this section must contain:

- (1) a specification of the contract or project on which the special rates will apply and a description of the work to be performed;
- (2) a brief narrative explaining why special wage rates are necessary;
- (3) the job class or classes involved;
- (4) the special wage rates the applicant is requesting, including survey or other relevant wage data to support the requested rates;
- (5) the approximate number of employees who would be affected; and
- (6) any other information which might be helpful in determining if special wage rates are appropriate.

Requests made pursuant to the above should be addressed to:

Director
Alaska Department of Labor and Workforce Development
Labor Standards & Safety Division
Wage and Hour Administration
P.O. Box 111149
Juneau, AK 99811-1149

-or-

Email: anchorage.lss-wh@alaska.gov

**LABOR STANDARDS REGULATIONS
NOTICE REQUEST**

If you would like to receive *notices of proposed changes to regulations* for Wage and Hour or Mechanical Inspection, please indicate below the programs for which you are interested in receiving such notices, print your name and email or mailing address in the space provided, and send this page to:

Alaska Department of Labor and Workforce Development
Labor Standards & Safety Division
Wage and Hour Administration
1251 Muldoon Road, Suite 113
Anchorage, AK 99504-2098
Email: anchorage.lss-wh@alaska.gov

For *REGULATIONS* information relating to any of the following:

- Wage and Hour Title 23 Employment Practices
- Wage and Hour Title 36 Public Works
- Employment Agencies
- Child Labor
- Employment Preference (Local Hire)
- Plumbing Code
- Electrical Code
- Boiler/Pressure Vessel Construction Code
- Elevator Code
- Certificates of Fitness
- Recreational Devices

Request any of the following *PUBLICATIONS* by checking below:

- | | |
|--|---|
| <input type="checkbox"/> Wage and Hour Title 23 Employment Practices | <input type="checkbox"/> Public Construction Pamphlet |
| <input type="checkbox"/> Minimum Wage & Overtime Poster | <input type="checkbox"/> Public Construction Wage Rates |
| <input type="checkbox"/> Child Labor Poster | <input type="checkbox"/> Child Labor Pamphlet |

PLEASE NOTE: DUE TO INCREASED MAILING AND PRINTING COSTS, ONLY ONE OF EACH PUBLICATION REQUESTED WILL BE MAILED TO YOU. IF YOU WISH TO RECEIVE ADDITIONAL COPIES OR SUBSEQUENT PUBLICATIONS, PLEASE CONTACT OUR OFFICE AT (907) 269-4900.

Name: _____

Mailing Address: _____

Email Address: _____

EMPLOYMENT PREFERENCE INFORMATION
(EFFECTIVE August 16, 2013)

By authority of AS 36.10.150 and 8 AAC 30.064, the Commissioner of Labor and Workforce Development has determined the 15 boroughs and census areas listed below to be Zones of Underemployment. A Zone of Underemployment requires that Alaska residents who are eligible under AS 36.10.140 be given a minimum of 90 percent employment preference on public works contracts throughout the state in certain job classifications. This hiring preference applies on a project-by-project, craft-by-craft or occupational basis and must be met each workweek by each contractor/subcontractor.

For additional information about the Alaska resident hire requirements, contact the nearest Wage and Hour Office in Anchorage at (907) 269-4900, in Fairbanks at (907) 451-2886 or in Juneau at (907) 465-4248.

The following classifications qualify for a minimum of 90 percent Alaska resident hire preference:

Aleutians East Borough: Plumbers and Pipefitters

Aleutians West Borough: Painters

Bethel Census Area: Culinary Workers, Foremen and Supervisors, Mechanics, Painters, Surveyors, Tug Boat Workers

Denali Borough: Carpenters

Dillingham Census Area: Carpenters, Culinary Workers, Electricians, Equipment Operators, Foremen and Supervisors, Laborers, Mechanics, Truck Drivers, Tug Boat Workers

Hoonah-Angoon Census Area: Carpenters, Culinary Workers, Electricians, Equipment Operators, Foremen and Supervisors, Laborers, Mechanics, Painters, Truck Drivers

Nome Census Area: Carpenters, Culinary Workers, Electricians, Equipment Operators, Foremen and Supervisors, Laborers, Mechanics, Surveyors, Truck Drivers, Tug Boat Workers, Welders

Northwest Arctic Borough: Carpenters, Culinary Workers, Electricians, Equipment Operators, Foremen and Supervisors, Plumbers and Pipefitters, Surveyors, Truck Drivers, Tug Boat Workers, Welders

Petersburg Borough: Culinary Workers, Engineers and Architects, Foremen and Supervisors, Laborers

Prince of Wales-Hyder Census Area: Carpenters, Culinary Workers, Electricians, Equipment Operators, Foremen and Supervisors, Laborers, Mechanics, Surveyors, Truck Drivers, Welders

Skagway: None

Southeast Fairbanks Census Area: Carpenters, Culinary Workers, Equipment Operators, Laborers, Painters, Truck Drivers

Wade Hampton Census Area: Carpenters, Electricians, Engineers and Architects, Mechanics, Roofers

Yakutat: None

Yukon-Koyukuk Census Area: Culinary Workers, Electricians, Foremen and Supervisors, Painters, Plumbers and Pipefitters, Surveyors, Truck Drivers, Tug Boat Workers, Welders

This determination is effective August 16, 2013, and remains in effect until June 30, 2015.

The first person on a certified payroll in any classification is called the "first worker" and is not required to be an Alaskan resident. However, once the contractor adds any more workers in the classification, then all workers in the classification are counted, and the 90 percent is applied to compute the number of required Alaskans to be in compliance. To compute the number of Alaskan residents required in a workweek in a particular classification, multiply the number of workers in the classification by 90 percent. The result is then rounded down to the nearest whole number to determine the number of Alaskans that must be employed.

If a worker works in more than one classification during a week, the classification in which they spent the most time would be counted for employment preference purposes. If the time is split evenly between two classifications, the worker is counted in both classifications.

If you have difficulty meeting the 90 percent requirement, an approved waiver must be obtained before a non-Alaskan resident is hired who would put the contractor/subcontractor out of compliance (8 AAC 30.081 (e) (f)). The waiver process requires proof of an intensive search for qualified Alaskan workers. To apply for a waiver, contact the nearest Wage and Hour Office for instructions.

Here is an example to apply the 90 percent requirement to four carpenter workers. Multiply four workers by 90% and drop the fraction ($.90 \times 4 = 3.6 - .6 = 3$). The remaining number is the number of Alaskan resident carpenters required to be in compliance in that particular classification for that week.

The penalties for being out of compliance are serious. AS 36.10.100 (a) states "A contractor who violates a provision of this chapter shall have deducted from amounts due to the contractor under the contract the prevailing wages which should have been paid to a displaced resident, and these amounts shall be retained by the contracting agency." If a contractor/subcontractor is found to be out of compliance, penalties accumulate until they come into compliance.

If you have difficulty determining whether a worker is an Alaska resident, you should contact the nearest Wage and Hour Office. Contact Wage and Hour in Anchorage at (907) 269-4900, in Fairbanks at (907) 451-2886, or in Juneau at (907) 465-4842.

**Alaska Department of Labor and Workforce Development
Labor Standards & Safety Division
Wage and Hour Administration
Web site: <http://labor.state.ak.us/lss/pamp600.htm>**

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DEBARMENT LIST

AS 36.05.090(b) states that “the state disbursing officer or the local fiscal officer shall distribute to all departments of the state government and to all political subdivisions of the state a list giving the names of persons who have disregarded their obligations to employees.”

A person appearing on the following debarment list and a firm, corporation, partnership, or association in which the person has an interest may not work as a contractor or subcontractor on a public construction contract for the state or a political subdivision of the state for three years from the date of debarment.

Company Name

Date of Debarment

Debarment Expires

No companies are currently debarred.

Laborers' & Mechanics' Minimum Rates of Pay

Class Code	Classification of Laborers & Mechanics	BHR	H&W	PEN	TRN	Other Benefits	THR
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Boilermakers

						VAC	SAF	
A0101	Boilermaker (journeyman)	44.01	8.57	15.34	0.75	3.00	0.34	72.01

Bricklayers & Blocklayers

**See note on last page if remote site

						L&M		
A0201	Blocklayer	39.03	9.53	8.50	0.55	0.15	0.28	58.04
	Bricklayer							
	Marble or Stone Mason							
	Refractory Worker (Firebrick, Plastic, Castable, and Gunitite Refractory Applications)							
	Terrazzo Worker							
	Tile Setter							

						L&M		
A0202	Tuck Pointer Caulker Cleaner (PCC)	39.03	9.53	8.50	0.55	0.15	0.28	58.04

						L&M		
A0203	Marble & Tile Finisher Terrazzo Finisher	33.27	9.53	8.50	0.55	0.15	0.28	52.28

						L&M		
A0204	Torginal Applicator	37.14	9.53	8.50	0.55	0.15	0.28	56.15

Carpenters, Statewide

**See note on last page if remote site

						L&M	SAF	
A0301	Carpenter (journeyman) Lather/Drywall/Acoustical	36.59	9.78	12.11	0.70	0.10	0.15	59.43

Cement Masons, Region I (North of N63 latitude)

**See note on last page if remote site

						L&M		
N0401	Group I, including: Application of Sealing Compound Application of Underlayment Building, General Cement Mason (journeyman) Concrete Concrete Paving Curb & Gutter, Sidewalk Curing of All Concrete Grouting & Caulking of Tilt-Up Panels	35.69	7.24	11.80	0.85	0.10		55.68

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; LML=labor/management fund & LEG combined; ONT=overnight; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Class Code	Classification of Laborers & Mechanics	BHR	H&W	PEN	TRN	Other Benefits	THR
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Cement Masons, Region I (North of N63 latitude)

**See note on last page if remote site

							L&M	
N0401	Group I, including:	35.69	7.24	11.80	0.85	0.10		55.68
	Grouting of All Plates							
	Patching Concrete							
	Screed Pin Setter							
	Spackling/Skim Coating							
N0402	Group II, including:	35.69	7.24	11.80	0.85	0.10		55.68
	Form Setter							
N0403	Group III, including:	35.69	7.24	11.80	0.85	0.10		55.68
	Concrete Saw (self-powered)							
	Curb & Gutter Machine							
	Floor Grinder							
	Pneumatic Power Tools							
	Power Chipping & Bushing							
	Sand Blasting Architectural Finish							
	Screed & Rodding Machine Operator							
	Troweling Machine Operator							
N0404	Group IV, including:	35.69	7.24	11.80	0.85	0.10		55.68
	Application of All Composition Mastic							
	Application of All Epoxy Material							
	Application of All Plastic Material							
	Finish Colored Concrete							
	Gunite Nozzleman							
	Hand Powered Grinder							
	Tunnel Worker							
N0405	Group V, including:	35.94	7.24	11.80	0.85	0.10		55.93
	Plasterer							

Cement Masons, Region II (South of N63 latitude)

**See note on last page if remote site

							L&M	
S0401	Group I, including:	35.44	7.24	11.80	0.85	0.10		55.43
	Application of Sealing Compound							
	Application of Underlayment							
	Building, General							
	Cement Mason (journeyman)							
	Concrete							
	Concrete Paving							
	Curb & Gutter, Sidewalk							
	Curing of All Concrete							

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Class Code	Classification of Laborers & Mechanics	BHR	H&W	PEN	TRN	Other Benefits	THR
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Cement Masons, Region II (South of N63 latitude)

**See note on last page if remote site

						L&M	
S0401	Group I, including:	35.44	7.24	11.80	0.85	0.10	55.43
	Grouting & Caulking of Tilt-Up Panels						
	Grouting of All Plates						
	Patching Concrete						
	Screed Pin Setter						
	Spackling/Skim Coating						
						L&M	
S0402	Group II, including:	35.44	7.24	11.80	0.85	0.10	55.43
	Form Setter						
						L&M	
S0403	Group III, including:	35.44	7.24	11.80	0.85	0.10	55.43
	Concrete Saw (self-powered)						
	Curb & Gutter Machine						
	Floor Grinder						
	Pneumatic Power Tools						
	Power Chipping & Bushing						
	Sand Blasting Architectural Finish						
	Screed & Rodding Machine Operator						
	Troweling Machine Operator						
						L&M	
S0404	Group IV, including:	35.44	7.24	11.80	0.85	0.10	55.43
	Application of All Composition Mastic						
	Application of All Epoxy Material						
	Application of All Plastic Material						
	Finish Colored Concrete						
	Gunite Nozzleman						
	Hand Powered Grinder						
	Tunnel Worker						
						L&M	
S0405	Group V, including:	35.69	7.24	11.80	0.85	0.10	55.68
	Plasterer						

Culinary Workers * See note on last page

						LEG	
A0501	Baker/Cook	24.67	5.37	5.73		0.05	35.82
						LEG	
A0503	General Helper	21.62	5.37	5.73		0.05	32.77
	Housekeeper						
	Janitor						
	Kitchen Helper						
						LEG	
A0504	Head Cook	25.22	5.37	5.73		0.05	36.37

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Class Code	Classification of Laborers & Mechanics	BHR	H&W	PEN	TRN	Other	Benefits	THR
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Culinary Workers * See note on last page

A0505	Head Housekeeper	22.04	5.37	5.73			LEG	
	Head Kitchen Help						0.05	33.19

Dredgemen
**See note on last page if remote site

A0601	Assistant Engineer, including:	38.51	9.35	10.00	1.00		L&M	
	Craneman							
	Electrical Generator Operator (primary pump/power barge/dredge)							
	Engineer							
	Welder							
A0602	Assistant Mate (deckhand)	37.35	9.35	10.00	1.00		L&M	57.80
A0603	Fireman	37.79	9.35	10.00	1.00		L&M	58.24
A0605	Leverman Clamshell	41.04	9.35	10.00	1.00		L&M	61.49
A0606	Leverman Hydraulic	39.28	9.35	10.00	1.00		L&M	59.73
A0607	Mate & Boatman	38.51	9.35	10.00	1.00		L&M	58.96
A0608	Oiler (dredge)	37.79	9.35	10.00	1.00		L&M	58.24

Electricians

A0701	Inside Cable Splicer	39.82	11.06	12.59	0.95		L&M	LEG	
							0.20	0.15	64.77
A0702	Inside Journeyman Wireman, including:	38.79	11.06	12.81	0.95		L&M	LEG	
	Technicians						0.20	0.15	63.96
A0703	Power Cable Splicer	51.52	11.06	16.62	0.95		LML	SAF	
							0.35	0.50	81.00
A0704	Tele Com Cable Splicer	47.45	11.06	14.57	0.95		L&M	LEG	
							0.20	0.15	74.38
A0705	Power Journeyman Lineman, including:	49.77	11.06	16.56	0.95		LML	SAF	
	Power Equipment Operator						0.35	0.50	79.19
	Technician								
A0706	Tele Com Journeyman Lineman, including:	45.70	11.06	14.52	0.95		L&M	LEG	
	Technician						0.20	0.15	72.58
	Tele Com Equipment Operator								

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Class Code	Classification of Laborers & Mechanics	BHR	H&W	PEN	TRN	Other	Benefits	THR
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Electricians

						L&M	LEG	
A0707	Straight Line Installer - Repairman	45.70	11.06	14.52	0.95	0.20	0.15	72.58
						LML	SAF	
A0708	Powderman	47.77	11.06	16.50	0.95	0.35	0.50	77.13
						L&M	LEG	
A0710	Material Handler	26.28	10.26	4.54	0.15	0.15	0.15	41.53
						L&M	LEG	
A0712	Tree Trimmer Groundman	26.67	11.06	9.45	0.15	0.15	0.15	47.63
						L&M	LEG	
A0713	Journeyman Tree Trimmer	35.34	11.06	9.71	0.15	0.15	0.15	56.56
						L&M	LEG	
A0714	Vegetation Control Sprayer	38.79	11.06	9.81	0.15	0.15	0.15	60.11
						L&M		
A0715	Inside Journeyman Communications CO/PBX	38.07	11.06	12.54	0.95	0.20	0.15	62.97

Elevator Workers

						L&M	VAC	
A0802	Elevator Constructor	35.29	12.73	13.46	0.60	0.30	3.21	65.59
						L&M	VAC	
A0803	Elevator Constructor Mechanic	50.42	12.73	13.46	0.60	0.30	5.59	83.10

Heat & Frost Insulators/Asbestos Workers

**See note on last page if remote site

						SAF		
A0902	Asbestos Abatement-Mechanical Systems	34.88	8.44	9.51	0.60	0.12		53.55
						SAF		
A0903	Asbestos Abatement/General Demolition All Systems	34.88	8.44	9.51	0.60	0.12		53.55
						SAF		
A0904	Insulator, Group II	34.88	8.44	9.51	0.60	0.12		53.55
						SAF		
A0905	Fire Stop	34.88	8.44	9.51	0.60	0.12		53.55

IronWorkers

**See note on last page if remote site

						L&M	IAF	
A1101	Ironworkers, including:	33.55	7.58	17.00	0.95	0.43	0.10	59.61
	Bender Operators							
	Bridge & Structural							
	Machinery Mover							
	Ornamental							
	Reinforcing							
	Rigger							
	Sheeter							

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IronWorkers

**See note on last page if remote site

						L&M	IAF	
A1101	Ironworkers, including:	33.55	7.58	17.00	0.95	0.43	0.10	59.61
	Signalman							
	Stage Rigger							
	Toxic Haz-Mat Work							
	Welder							
A1102	Helicopter	34.55	7.58	17.00	0.95	0.43	0.10	60.61
	Tower (energy producing windmill type towers to include nacelle and blades)							
A1103	Fence/Barrier Installer	30.05	7.58	16.75	0.95	0.43	0.10	55.86
	Guard Rail Installer							
A1104	Guard Rail Layout Man	30.79	7.58	16.75	0.95	0.43	0.10	56.60

Laborers (The Alaska areas north of N63 latitude and east of W138 longitude)

**See note on last page if remote site

						L&M	LEG	
N1201	Group I, including:	29.25	7.24	13.73	1.20	0.20	0.15	51.77
	Asphalt Worker (shovelman, plant crew)							
	Brush Cutter							
	Camp Maintenance Laborer							
	Carpenter Tender or Helper							
	Choke Setter, Hook Tender, Rigger, Signalman							
	Concrete Labor (curb & gutter, chute handler, grouting, curing, screeding)							
	Crusher Plant Laborer							
	Demolition Laborer							
	Ditch Digger							
	Dumpman							
	Environmental Laborer (hazard/toxic waste, oil spill)							
	Fence Installer							
	Fire Watch Laborer							
	Flagman							
	Form Stripper							
	General Laborer							
	Guardrail Laborer, Bridge Rail Installer							
	Hydro-seeder Nozzleman							
	Laborer, Building							
	Landscaper or Planter							
	Laying of Mortarless Decorative Block (retaining walls, flowered decorative block 4 feet or less - highway or landscape work)							
	Material Handler							

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; LML=labor/management fund & LEG combined; ONT=overnight; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Laborers (The Alaska areas north of N63 latitude and east of W138 longitude)

**See note on last page if remote site

					L&M	LEG	
N1201	Group I, including:	29.25	7.24	13.73	1.20	0.20	0.15 51.77
	Pneumatic or Power Tools						
	Portable or Chemical Toilet Serviceman						
	Pump Man or Mixer Man						
	Railroad Track Laborer						
	Sandblast, Pot Tender						
	Saw Tender						
	Slurry Work						
	Stake Hopper						
	Steam Cleaner Operator						
	Steam Point or Water Jet Operator						
	Tank Cleaning						
	Utiliwalk & Utilidor Laborer						
	Watchman (construction projects)						
	Window Cleaner						

					L&M	LEG	
N1202	Group II, including:	30.25	7.24	13.73	1.20	0.20	0.15 52.77
	Burning & Cutting Torch						
	Cement or Lime Dumper or Handler (sack or bulk)						
	Choker Splicer						
	Chucktender (wagon, air-track & hydraulic drills)						
	Concrete Laborer (power buggy, concrete saws, pumpcrete nozzleman, vibratorman)						
	Culvert Pipe Laborer						
	Cured Inplace Pipelayer						
	Environmental Laborer (asbestos, marine work)						
	Foam Gun or Foam Machine Operator						
	Green Cutter (dam work)						
	Gunite Operator						
	Hod Carrier						
	Jackhammer or Pavement Breaker (more than 45 pounds)						
	Laser Instrument Operator						
	Laying of Mortarless Decorative Block (retaining walls, flowered decorative block over 4 feet - highway or landscape work)						
	Mason Tender & Mud Mixer (sewer work)						
	Pilot Car						
	Pipelayer Helper						
	Plasterer, Bricklayer & Cement Finisher Tender						
	Powderman Helper						
	Power Saw Operator						
	Railroad Switch Layout Laborer						
	Sandblaster						
	Scaffold Building & Erecting						

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; LML=labor/management fund & LEG combined; ONT=overnight; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Laborers (The Alaska areas north of N63 latitude and east of W138 longitude)

**See note on last page if remote site

						L&M	LEG	
N1202	Group II, including:	30.25	7.24	13.73	1.20	0.20	0.15	52.77
	Sewer Caulker							
	Sewer Plant Maintenance Man							
	Thermal Plastic Applicator							
	Timber Faller, Chainsaw Operator, Filer							
	Timberman							

						L&M	LEG	
N1203	Group III, including:	31.15	7.24	13.73	1.20	0.20	0.15	53.67
	Bit Grinder							
	Camera/Tool/Video Operator							
	Guardrail Machine Operator							
	High Rigger & Tree Topper							
	High Scaler							
	Multiplate							
	Plastic Welding							
	Slurry Seal Squeegee Man							
	Traffic Control Supervisor							
	Welding Certified (in connection with laborer's work)							

						L&M	LEG	
N1204	Group IIIA	34.43	7.24	13.73	1.20	0.20	0.15	56.95
	Asphalt Raker, Asphalt Belly Dump Lay Down							
	Drill Doctor (in the field)							
	Driller (including, but not limited to, wagon drills, air-track drills, hydraulic drills)							
	Licensed Powderman							
	Pioneer Drilling & Drilling Off Tugger (all type drills)							
	Pipelayers							

						L&M	LEG	
N1205	Group IV	18.82	7.24	13.73	1.20	0.20	0.15	41.34
	Final Building Cleanup							
	Permanent Yard Worker							

						L&M	LEG	
N1206	Group IIIB	35.26	7.24	13.73	1.20	0.20	0.15	57.78
	Federally Licensed Powderman (Responsible Person in Charge)							
	Grade Checking (setting or transferring of grade marks, line and grade)							

Laborers (The area that is south of N63 latitude and west of W138 longitude)

**See note on last page if remote site

						L&M	LEG	
S1201	Group I, including:	29.25	7.24	13.73	1.20	0.20	0.15	51.77
	Asphalt Worker (shovelman, plant crew)							
	Brush Cutter							
	Camp Maintenance Laborer							

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Laborers (The area that is south of N63 latitude and west of W138 longitude)

**See note on last page if remote site

					L&M	LEG		
S1201	Group I, including:	29.25	7.24	13.73	1.20	0.20	0.15	51.77
	Carpenter Tender or Helper							
	Choke Setter, Hook Tender, Rigger, Signalman							
	Concrete Labor (curb & gutter, chute handler, grouting, curing, screeding)							
	Crusher Plant Laborer							
	Demolition Laborer							
	Ditch Digger							
	Dumpman							
	Environmental Laborer (hazard/toxic waste, oil spill)							
	Fence Installer							
	Fire Watch Laborer							
	Flagman							
	Form Stripper							
	General Laborer							
	Guardrail Laborer, Bridge Rail Installer							
	Hydro-seeder Nozzleman							
	Laborer, Building							
	Landscaper or Planter							
	Laying of Mortarless Decorative Block (retaining walls, flowered decorative block 4 feet or less - highway or landscape work)							
	Material Handler							
	Pneumatic or Power Tools							
	Portable or Chemical Toilet Serviceman							
	Pump Man or Mixer Man							
	Railroad Track Laborer							
	Sandblast, Pot Tender							
	Saw Tender							
	Slurry Work							
	Stake Hopper							
	Steam Cleaner Operator							
	Steam Point or Water Jet Operator							
	Tank Cleaning							
	Utiliwalk & Utilidor Laborer							
	Watchman (construction projects)							
	Window Cleaner							
S1202	Group II, including:	30.25	7.24	13.73	1.20	0.20	0.15	52.77
	Burning & Cutting Torch							
	Cement or Lime Dumper or Handler (sack or bulk)							
	Choker Splicer							
	Chucktender (wagon, air-track & hydraulic drills)							

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; LML=labor/management fund & LEG combined; ONT=overnight; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Laborers (The area that is south of N63 latitude and west of W138 longitude)
 **See note on last page if remote site

		L&M	LEG					
S1202	Group II, including:	30.25	7.24	13.73	1.20	0.20	0.15	52.77
	Concrete Laborer (power buggy, concrete saws, pumpcrete nozzleman, vibratorman)							
	Culvert Pipe Laborer							
	Cured Inplace Pipelayer							
	Environmental Laborer (asbestos, marine work)							
	Foam Gun or Foam Machine Operator							
	Green Cutter (dam work)							
	Gunite Operator							
	Hod Carrier							
	Jackhammer or Pavement Breaker (more than 45 pounds)							
	Laser Instrument Operator							
	Laying of Mortarless Decorative Block (retaining walls, flowered decorative block over 4 feet - highway or landscape work)							
	Mason Tender & Mud Mixer (sewer work)							
	Pilot Car							
	Pipelayer Helper							
	Plasterer, Bricklayer & Cement Finisher Tender							
	Powderman Helper							
	Power Saw Operator							
	Railroad Switch Layout Laborer							
	Sandblaster							
	Scaffold Building & Erecting							
	Sewer Caulker							
	Sewer Plant Maintenance Man							
	Thermal Plastic Applicator							
	Timber Faller, Chainsaw Operator, Filer							
	Timberman							

		L&M	LEG					
S1203	Group III, including:	31.15	7.24	13.73	1.20	0.20	0.15	53.67
	Bit Grinder							
	Camera/Tool/Video Operator							
	Guardrail Machine Operator							
	High Rigger & Tree Topper							
	High Scaler							
	Multiplate							
	Plastic Welding							
	Slurry Seal Squeegee Man							
	Traffic Control Supervisor							
	Welding Certified (in connection with laborer's work)							

		L&M	LEG					
S1204	Group IIIA	34.43	7.24	13.73	1.20	0.20	0.15	56.95
	Asphalt Raker, Asphalt Belly Dump Lay Down							

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Class Code	Classification of Laborers & Mechanics	BHR	H&W	PEN	TRN	Other	Benefits	THR
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Laborers (The area that is south of N63 latitude and west of W138 longitude)
 **See note on last page if remote site

						L&M	LEG	
S1204	Group IIIA	34.43	7.24	13.73	1.20	0.20	0.15	56.95
	Drill Doctor (in the field)							
	Driller (including, but not limited to, wagon drills, air-track drills, hydraulic drills)							
	Licensed Powderman							
	Pioneer Drilling & Drilling Off Tugger (all type drills)							
	Pipelayers							
S1205	Group IV	18.82	7.24	13.73	1.20	0.20	0.15	41.34
	Final Building Cleanup							
	Permanent Yard Worker							
S1206	Group IIIB	35.26	7.24	13.73	1.20	0.20	0.15	57.78
	Federally Licensed Powderman (Responsible Person in Charge)							
	Grade Checking (setting or transferring of grade marks, line and grade)							

Millwrights

						L&M		
A1251	Millwright (journeyman)	34.99	9.78	9.76	1.00	0.25	0.15	55.93
A1252	Millwright Welder	35.58	9.78	9.76	1.00	0.25	0.15	56.52

Painters, Region I (North of N63 latitude)
 **See note on last page if remote site

						L&M		
N1301	Group I, including:	31.10	7.55	11.10	0.83	0.07		50.65
	Brush							
	General Painter							
	Hand Taping							
	Hazardous Material Handler							
	Lead-Based Paint Abatement							
	Roll							
N1302	Group II, including:	31.62	7.55	11.10	0.83	0.07		51.17
	Bridge Painter							
	Epoxy Applicator							
	General Drywall Finisher							
	Hand/Spray Texturing							
	Industrial Coatings Specialist							
	Machine/Automatic Taping							
	Pot Tender							
	Sandblasting							

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; LML=labor/management fund & LEG combined; ONT=overnight; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Class Code	Classification of Laborers & Mechanics	BHR	H&W	PEN	TRN	Other	Benefits	THR
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Painters, Region I (North of N63 latitude)

**See note on last page if remote site

		L&M					
N1302	Group II, including:	31.62	7.55	11.10	0.83	0.07	51.17
	Specialty Painter						
	Spray						
	Structural Steel Painter						
	Wallpaper/Vinyl Hanger						
N1304	Group IV, including:	36.51	7.55	10.96	0.80	0.05	55.87
	Glazier						
	Storefront/Automatic Door Mechanic						
N1305	Group V, including:	29.79	7.55	5.02	0.83	0.07	43.26
	Carpet Installer						
	Floor Coverer						
	Heat Weld/Cove Base						
	Linoleum/Soft Tile Installer						

Painters, Region II (South of N63 latitude)

**See note on last page if remote site

		L&M					
S1301	Group I, including :	29.34	7.55	10.85	0.83	0.07	48.64
	Brush						
	General Painter						
	Hand Taping						
	Hazardous Material Handler						
	Lead-Based Paint Abatement						
	Roll						
	Spray						
S1302	Group II, including :	30.59	7.55	10.85	0.83	0.07	49.89
	General Drywall Finisher						
	Hand/Spray Texturing						
	Machine/Automatic Taping						
	Wallpaper/Vinyl Hanger						
S1303	Group III, including :	30.69	7.55	10.85	0.83	0.07	49.99
	Bridge Painter						
	Epoxy Applicator						
	Industrial Coatings Specialist						
	Pot Tender						
	Sandblasting						
	Specialty Painter						
	Structural Steel Painter						

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; LML=labor/management fund & LEG combined; ONT=overnight; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Class Code	Classification of Laborers & Mechanics	BHR	H&W	PEN	TRN	Other	Benefits	THR
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Painters, Region II (South of N63 latitude)

**See note on last page if remote site

							L&M	
S1304	Group IV, including:	36.51	7.55	10.21	0.83	0.07		55.17
	Glazier							
	Storefront/Automatic Door Mechanic							

							L&M	
S1305	Group V, including:	29.79	7.55	5.02	0.83	0.07		43.26
	Carpet Installer							
	Floor Coverer							
	Heat Weld/Cove Base							
	Linoleum/Soft Tile Installer							

Piledrivers

**See note on last page if remote site

						L&M	IAF	
A1401	Piledriver	36.59	9.78	12.11	0.70	0.10	0.15	59.43
	Assistant Dive Tender							
	Carpenter/Piledriver							
	Rigger							
	Sheet Stabber							
	Skiff Operator							

						L&M	IAF	
A1402	Piledriver-Welder/Toxic Worker	37.59	9.78	12.11	0.70	0.10	0.15	60.43

						L&M	IAF	
A1403	Remotely Operated Vehicle Pilot/Technician	40.90	9.78	12.11	0.70	0.10	0.15	63.74
	Single Atmosphere Suit, Bell or Submersible Pilot							

						L&M	IAF	
A1404	Diver (working) ***See note on last page	80.70	9.78	12.11	0.70	0.10	0.15	103.54

						L&M	IAF	
A1405	Diver (standby) ***See note on last page	40.90	9.78	12.11	0.70	0.10	0.15	63.74

						L&M	IAF	
A1406	Dive Tender ***See note on last page	39.90	9.78	12.11	0.70	0.10	0.15	62.74

						L&M	IAF	
A1407	Welder (American Welding Society, Certified Welding Inspector)	42.15	9.78	12.11	0.70	0.10	0.15	64.99

Plumbers, Region I (North of N63 latitude)

						L&M	S&L	
N1501	Journeyman Pipefitter	39.96	7.05	12.70	0.95	1.10		61.76
	Plumber							
	Welder							

Plumbers, Region II (South of N63 latitude)

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; LML=labor/management fund & LEG combined; ONT=overnight; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Plumbers, Region II (South of N63 latitude)

							L&M	
S1501	Journeyman Pipefitter	38.46	8.42	10.82	1.50	0.20		59.40
	Plumber							
	Welder							

Plumbers, Region IIA (1st Judicial District)

							L&M	
X1501	Journeyman Pipefitter	36.52	12.47	11.00	2.50	0.24		62.73
	Plumber							
	Welder							

Power Equipment Operators

**See note on last page if remote site

							L&M	
A1601	Group I, including:	39.28	9.35	10.00	1.00	0.10		59.73
	Asphalt Roller: Breakdown, Intermediate, and Finish							
	Back Filler							
	Barrier Machine (Zipper)							
	Beltcrete with Power Pack & similar conveyors							
	Bending Machine							
	Boat Coxswain							
	Bulldozer							
	Cableways, Highlines & Cablecars							
	Cleaning Machine							
	Coating Machine							
	Concrete Hydro Blaster							
	Cranes (45 tons & under or 150 feet of boom & under (including jib & 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)							
	Drag Scraper, Yarder, and similar types							
	Drilling Machines, Core, Cable, Rotary and Exploration							
	Finishing Machine Operator, Concrete Paving, Laser Screed, Sidewalk, Curb & Gutter Machine							
	Helicopters							
	Hover Craft, Flex Craft, Loadmaster, Air Cushion, All-Terrain Vehicle, Rollagon, Bargecable, Nodwell, & Snow Cat							
	Hydro Ax, Feller Buncher & similar							
	Licensed Line & Grade							
	Loaders (2 1/2 yards through 5 yards, including all attachments):							

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; LML=labor/management fund & LEG combined; ONT=overnight; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Power Equipment Operators
 **See note on last page if remote site

						L&M		
A1601 Group I, including:	39.28	9.35	10.00	1.00	0.10			59.73
(a) Forklifts (with telescopic boom & swing attachment)								
(b) Front End & Overhead, (2-1/2 yards through 5 yards)								
(c) Loaders, (with forks or pipe clamp)								
(d) Loaders, (elevating belt type, Euclid & similar types)								
Mechanic, Welder, Bodyman, Electrical, Camp & Maintenance Engineer								
Micro Tunneling Machine								
Mixers: Mobile type with hoist combination								
Motor Patrol Grader								
Mucking Machine: Mole, Tunnel Drill, Horizontal/Directional Drill								
Operator and/or Shield								
Operator on Dredges								
Piledriver Engineer, L.B. Foster, Puller or similar paving breaker								
Plant Operator (Asphalt & Concrete)								
Power Plant, Turbine Operator 200 k.w & over (power plants or combination of power units over 300 k.w.)								
Remote Controlled Equipment								
Scraper (through 40 yards)								
Service Oiler/Service Engineer								
Shot Blast Machine								
Shovels, Backhoes, Excavators with all attachments, and Gradealls (3 yards & under)								
Sideboom (under 45 tons)								
Spreaders, Blaw Knox, Cedarapids, Barber Greene, Slurry Machine								
Sub Grader (Gurries, Reclaimer & similar types)								
Tack Tractor								
Truck Mounted Concrete Pump, Conveyor & Creter								
Unlicensed Off-Road Hauler								
Wate Kote Machine								
						L&M		
A1602 Group IA, including:	41.04	9.35	10.00	1.00	0.10			61.49
Camera/Tool/Video Operator (Slipline)								
Certified Welder, Electrical Mechanic, Camp Maintenance Engineer, Mechanic (over 10,000 hours)								
Cranes (over 45 tons or 150 feet including jib & attachments)								
(a) Clamshells & Draglines (over 3 yards)								
(b) Tower Cranes								
Licensed Water/Waste Water Treatment Operator								
Loaders (over 5 yards)								
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. & over)								
Quad								

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; LML=labor/management fund & LEG combined; ONT=overnight; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Power Equipment Operators

**See note on last page if remote site

	BHR	H&W	PEN	TRN	Other	Benefits	THR
L&M							
A1602 Group IA, including:	41.04	9.35	10.00	1.00	0.10		61.49
Scrapers (over 40 yards)							
Screed							
Shovels, Backhoes, Excavators with all attachments (over 3 yards)							
Sidebooms (over 45 tons)							
Slip Form Paver, C.M.I. & similar types							
L&M							
A1603 Group II, including:	38.51	9.35	10.00	1.00	0.10		58.96
Boiler - Fireman							
Cement Hogs & Concrete Pump Operator							
Conveyors (except those listed in Group I)							
Hoists on Steel Erection, Towermobiles & Air Tuggers							
Horizontal/Directional Drill Locator							
Licensed Grade Technician							
Loaders (i.e., Elevating Grader & Material Transfer Vehicle)							
Locomotives, Rod & Geared Engines							
Mixers							
Screening, Washing Plant							
Sideboom (cradling rock drill, regardless of size)							
Skidder							
Trenching Machines (under 16 inches)							
Water/Waste Water Treatment Operator							
L&M							
A1604 Group III, including:	37.79	9.35	10.00	1.00	0.10		58.24
"A" Frame Trucks, Deck Winches							
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 & Stake Hopper							
Hoists, Air Tuggers, Elevators							
Loaders:							
(a) Elevating-Athey, Barber Greene & similar types							
(b) Forklifts or Lumber Carrier (on construction job sites)							
(c) Forklifts, (with tower)							
(d) Overhead & Front End, (under 2-1/2 yards)							
Locomotives: Dinkey (air, steam, gas & electric) Speeders							
Mechanics, Light Duty							
Oil, Blower Distribution							

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; LML=labor/management fund & LEG combined; ONT=overnight; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Power Equipment Operators

**See note on last page if remote site

		L&M					
A1604	Group III, including:	37.79	9.35	10.00	1.00	0.10	58.24
	Posthole Digger, Mechanical						
	Pot Fireman (power agitated)						
	Power Plant, Turbine Operator, (under 200 k.w.)						
	Pumps, Water						
	Roller (other than Asphalt)						
	Saws, Concrete						
	Skid Hustler						
	Skid Steer (with all attachments)						
	Straightening Machine						
	Tow Tractor						

		L&M					
A1605	Group IV, including:	31.58	9.35	10.00	1.00	0.10	52.03
	Crane Assistant Engineer/Rig Oiler						
	Drill Helper						
	Parts & Equipment Coordinator						
	Spotter						
	Steam Cleaner						
	Swamper (on trenching machines or shovel type equipment)						

Roofers

**See note on last page if remote site

		L&M						
A1701	Rofer & Waterproofer	41.45	7.43	2.91	0.81	0.10	0.02	52.72
A1702	Rofer Material Handler	29.02	7.43	2.91	0.81	0.10	0.02	40.29

Sheet Metal Workers, Region I (North of N63 latitude)

		L&M					
N1801	Sheet Metal Journeyman	44.93	8.30	10.34	1.32	0.25	65.14
	Air Balancing and duct cleaning of HVAC systems						
	Brazing, soldering or welding of metals						
	Demolition of sheet metal HVAC systems						
	Fabrication and installation of exterior wall sheathing, siding, metal roofing, flashing, decking and architectural sheet metal work						
	Fabrication and installation of heating, ventilation and air conditioning ducts and equipment						
	Fabrication and installation of louvers and hoods						
	Fabrication and installation of sheet metal lagging						
	Fabrication and installation of stainless steel commercial or industrial food service equipment						
	Manufacture, fabrication assembly, installation and alteration of all ferrous and nonferrous metal work						

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; LML=labor/management fund & LEG combined; ONT=overnight; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Sheet Metal Workers, Region I (North of N63 latitude)

							L&M	
N1801	Sheet Metal Journeyman	44.93	8.30	10.34	1.32	0.25	65.14	
	Metal lavatory partitions							
	Preparation of drawings taken from architectural and engineering plans required for fabrication and erection of sheet metal work							
	Sheet Metal shelving							
	Sheet Metal venting, chimneys and breaching							
	Skylight installation							

Sheet Metal Workers, Region II (South of N63 latitude)

							L&M	
S1801	Sheet Metal Journeyman	39.99	8.30	11.20	1.10	0.33	60.92	
	Air Balancing and duct cleaning of HVAC systems							
	Brazing, soldering or welding of metals							
	Demolition of sheet metal HVAC systems							
	Fabrication and installation of exterior wall sheathing, siding, metal roofing, flashing, decking and architectural sheet metal work							
	Fabrication and installation of heating, ventilation and air conditioning ducts and equipment							
	Fabrication and installation of louvers and hoods							
	Fabrication and installation of sheet metal lagging							
	Fabrication and installation of stainless steel commercial or industrial food service equipment							
	Manufacture, fabrication assembly, installation and alteration of all ferrous and nonferrous metal work							
	Metal lavatory partitions							
	Preparation of drawings taken from architectural and engineering plans required for fabrication and erection of sheet metal work							
	Sheet Metal shelving							
	Sheet Metal venting, chimneys and breaching							
	Skylight installation							

Sprinkler Fitters

							L&M	
A1901	Sprinkler Fitter	42.89	8.52	13.05	0.45	0.25	65.16	

Surveyors

**See note on last page if remote site

							L&M	
A2001	Chief of Parties	42.11	7.38	9.99	1.20	0.10	60.78	
A2002	Party Chief	40.52	7.38	9.99	1.20	0.10	59.19	

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; LML=labor/management fund & LEG combined; ONT=overnight; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Class Code	Classification of Laborers & Mechanics	BHR	H&W	PEN	TRN	Other Benefits	THR
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Surveyors

**See note on last page if remote site

A2003	Line & Grade Technician/Office Technician	39.92	7.38	9.99	1.20	0.10	58.59
						L&M	
A2004	Associate Party Chief (including Instrument Person & Head Chain Person)	37.80	7.38	9.99	1.20	0.10	56.47
						L&M	
A2005	Stake Hop/Grademan	34.87	7.38	9.99	1.20	0.10	53.54
						L&M	
A2006	Chain Person (for crews with more than 2 people)	33.46	7.38	9.99	1.20	0.10	52.13
						L&M	

Truck Drivers

**See note on last page if remote site

A2101	Group I, including:	38.89	7.38	9.99	1.20	0.10	57.56
	Air/Sea Traffic Controllers						
	Ambulance/Fire Truck Driver (EMT certified)						
	Boat Coxswain						
	Captains & Pilots (air & water)						
	Deltas, Commanders, Rollagons, & similar equipment (when pulling sleds, trailers or similar equipment)						
	Dump Trucks (including rockbuggy & trucks with pups) over 40 yards up to & including 60 yards						
	Helicopter Transporter						
	Lowboys, including attached trailers & jeeps, up to & including 12 axles (over 12 axles or 150 tons to be negotiated)						
	Material Coordinator and Purchasing Agent						
	Ready-mix (over 12 yards up to & including 15 yards) (over 15 yards to be negotiated)						
	Semi with Double Box Mixer						
	Tireman, Heavy Duty/Fueler						
	Water Wagon (250 Bbls and above)						
						L&M	
A2102	Group 1A including:	40.16	7.38	9.99	1.20	0.10	58.83
	Dump Trucks (including rockbuggy & trucks with pups) over 60 yards up to & including 100 yards (over 100 yards to be negotiated)						
	Jeeps (driver under load)						
						L&M	
A2103	Group II, including:	37.63	7.38	9.99	1.20	0.10	56.30
	All Deltas, Commanders, Rollagons, & similar equipment						
	Construction and Material Safety Technician						
	Dump Trucks (including rockbuggy & trucks with pups) over 20 yards up to & including 40 yards						
	Lowboys (including attached trailers & jeeps up to & including 8 axles)						
	Mechanics						
	Partsman						

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; LML=labor/management fund & LEG combined; ONT=overnight; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Truck Drivers

**See note on last page if remote site

						L&M	
A2103	Group II, including:	37.63	7.38	9.99	1.20	0.10	56.30
	Ready-mix (over 7 yards up to & including 12 yards)						
	Stringing Truck						
	Super Vac Truck/Cacasco Truck/Heat Stress Truck						
	Turn-O-Wagon or DW-10 (not self loading)						
A2104	Group III, including:	36.81	7.38	9.99	1.20	0.10	55.48
	Batch Trucks (8 yards & up)						
	Dump Trucks (including rockbuggy & trucks with pups) over 10 yards up to & including 20 yards						
	Expeditor (electrical & pipefitting materials)						
	Greaser - Shop						
	Oil Distributor Driver						
	Thermal Plastic Layout Technician						
	Traffic Control Technician						
	Trucks/Jeeps (push or pull)						
A2105	Group IV, including:	36.23	7.38	9.99	1.20	0.10	54.90
	Air Cushion or similar type vehicle						
	All Terrain Vehicle						
	Boom Truck/Knuckle Truck (over 5 tons)						
	Buggymobile						
	Bull Lift & Fork Lift, Fork Lift with Power Boom & Swing Attachment (over 5 tons)						
	Bus Operator (over 30 passengers)						
	Combination Truck-Fuel & Grease						
	Compactor (when pulled by rubber tired equipment)						
	Dump Trucks (including Rockbuggy & trucks with pups up to & including 10 yards)						
	Dumpster						
	Expeditor (general)						
	Fire Truck/Ambulance Driver						
	Flat Beds, Dual Rear Axle						
	Foam Distributor Truck Dual Axle						
	Front End Loader with Fork						
	Gin Pole Truck, Winch Truck, Wrecker (truck mounted "A" frame manufactured rating over 5 tons)						
	Grease Truck						
	Hydro Seeder, Dual Axle						
	Hyster Operators (handling bulk aggregate)						
	Loadmaster (air & water operations)						
	Lumber Carrier						
	Ready-mix, (up to & including 7 yards)						

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; LML=labor/management fund & LEG combined; ONT=overnight; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Truck Drivers

**See note on last page if remote site

		L&M					
A2105	Group IV, including:	36.23	7.38	9.99	1.20	0.10	54.90
	Rigger (air/water/oilfield)						
	Semi or Truck & Trailer						
	Tireman, Light Duty						
	Track Truck Equipment						
	Vacuum Truck, Truck Vacuum Sweeper						
	Warehouseperson						
	Water Truck, Dual Axle						
	Water Wagon, Semi						

		L&M					
A2106	Group V, including:	35.47	7.38	9.99	1.20	0.10	54.14
	Batch Truck (up to & including 7 yards)						
	Boom Truck/Knuckle Truck (up to & including 5 tons)						
	Buffer Truck						
	Bull Lifts & Fork Lifts, Fork Lifts with Power Boom & Swing Attachments (up to & including 5 tons)						
	Bus Operator (up to 30 passengers)						
	Farm Type Rubber Tired Tractor (when material handling or pulling wagons on a construction project)						
	Flat Beds, Single Rear Axle						
	Foam Distributor Truck Single Axle						
	Fuel Handler (station/bulk attendant)						
	Gear/Supply Truck						
	Gin Pole Truck, Winch Truck, Wrecker (truck mounted "A" frame manufactured rating 5 tons & under)						
	Gravel Spreader Box Operator on Truck						
	Hydro Seeders, Single axle						
	Pickups (pilot cars & all light-duty vehicles)						
	Rigger/Swamper						
	Tack Truck						
	Team Drivers (horses, mules, & similar equipment)						
	Water Truck (Below 250 Bbls)						

Tunnel Workers, Laborers (The Alaska areas north of N63 latitude and east of W138 longitude)

**See note on last page if remote site

		L&M		LEG				
N2201	Group I, including:	32.18	7.24	13.73	1.20	0.20	0.15	54.70
	Brakeman							
	Mucker							
	Nipper							
	Topman & Bull Gang							
	Tunnel Track Laborer							

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; LML=labor/management fund & LEG combined; ONT=overnight; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Tunnel Workers, Laborers (The Alaska areas north of N63 latitude and east of W138 longitude)

**See note on last page if remote site

						L&M	LEG	
N2202	Group II, including:	33.28	7.24	13.73	1.20	0.20	0.15	55.80
	Burning & Cutting Torch							
	Concrete Laborer							
	Jackhammer							
	Laser Instrument Operator							
	Nozzlemen, Pumpcrete or Shotcrete							
	Pipelayer Helper							

						L&M	LEG	
N2203	Group III, including:	34.27	7.24	13.73	1.20	0.20	0.15	56.79
	Miner							
	Retimberman							

						L&M	LEG	
N2204	Group IIIA, including:	37.87	7.24	13.73	1.20	0.20	0.15	60.39
	Asphalt Raker, Asphalt Belly Dump Lay Down							
	Drill Doctor (in the field)							
	Driller (including, but not limited to wagon drills, air-track drills, hydraulic drills)							
	Licensed Powderman							
	Pioneer Drilling & Drilling Off Tugger (all type drills)							
	Pipelayer							

						L&M	LEG	
N2206	Group IIIB, including:	38.79	7.24	13.73	1.20	0.20	0.15	61.31
	Federally Licensed Powderman (Responsible Person in Charge)							
	Grade Checking (setting or transferring of grade marks, line and grade)							

Tunnel Workers, Laborers (The area that is south of N63 latitude and west of W138 longitude)

**See note on last page if remote site

						L&M	LEG	
S2201	Group I, including:	32.18	7.24	13.73	1.20	0.20	0.15	54.70
	Brakeman							
	Mucker							
	Nipper							
	Topman & Bull Gang							
	Tunnel Track Laborer							

						L&M	LEG	
S2202	Group II, including:	33.28	7.24	13.73	1.20	0.20	0.15	55.80
	Burning & Cutting Torch							
	Concrete Laborer							
	Jackhammer							
	Laser Instrument Operator							
	Nozzlemen, Pumpcrete or Shotcrete							
	Pipelayer Helper							

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; LML=labor/management fund & LEG combined; ONT=overnight; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

Tunnel Workers, Laborers (The area that is south of N63 latitude and west of W138 longitude)

**See note on last page if remote site

						L&M	LEG	
S2203	Group III, including:	34.27	7.24	13.73	1.20	0.20	0.15	56.79
	Miner							
	Retimberman							
S2204	Group IIIA, including:	37.87	7.24	13.73	1.20	0.20	0.15	60.39
	Asphalt Raker, Asphalt Belly Dump Lay Down							
	Drill Doctor (in the field)							
	Driller (including, but not limited to wagon drills, air-track drills, hydraulic drills)							
	Licensed Powderman							
	Pioneer Drilling & Drilling Off Tugger (all type drills)							
	Pipelayer							
S2206	Group IIIB, including:	38.79	7.24	13.73	1.20	0.20	0.15	61.31
	Federally Licensed Powderman (Responsible Person in Charge)							
	Grade Checking (setting or transferring of grade marks, line and grade)							

Tunnel Workers, Power Equipment Operators

**See note on last page if remote site

						L&M		
A2207	Group I	43.21	9.35	10.00	1.00	0.10		63.66
A2208	Group IA	45.14	9.35	10.00	1.00	0.10		65.59
A2209	Group II	42.36	9.35	10.00	1.00	0.10		62.81
A2210	Group III	41.57	9.35	10.00	1.00	0.10		62.02
A2211	Group IV	34.74	9.35	10.00	1.00	0.10		55.19

* A remote site is isolated and relatively distant from the amenities of civilization, and usually far from the employee's home. As a condition of employment, the workers must eat, sleep, and socialize at the worksite and remain there for extended periods.

** This classification must receive board and lodging under certain conditions. A per diem option of \$75 is an alternative to providing meals and lodging. See Page v for an explanation.

*** Work in combination of classifications: Employees working in any combination of classifications within the diving crew (working diver, standby diver, and tender) in a shift are paid in the classification with the highest rate for a minimum of 8 hours per shift.

Wage benefits key: BHR=basic hourly rate; H&W=health and welfare; IAF=industry advancement fund; LEG=legal fund; L&M=labor/management fund; LML=labor/management fund & LEG combined; ONT=overnight; PEN=pension fund; SAF=safety; SUI=supplemental unemployment insurance; S&L=SUI & LEG combined; TRN=training; THR=total hourly rate; VAC=vacation

APPENDIX C

Attachment 6 – “Wage Rate Requirements under
FY2010 Appropriations”

ATTACHMENT 6

Wage Rate Requirements Under FY 2010 Appropriations

Preamble

With respect to the Clean Water and Safe Drinking Water State revolving Funds, EPA provides capitalization grants to each State which in turn provides subgrants or loans to eligible entities within the State. Typically, the subrecipients are municipal or other local governmental entities that manage the funds. For these types of recipients, the provisions set forth under Roman Numeral I, below, shall apply. Although EPA and the State remain responsible for ensuring subrecipients' compliance with the wage rate requirements set forth herein, those subrecipients shall have the primary responsibility to maintain payroll records as described in Section 3(ii)(A), below and for compliance as described in Section I-5.

Occasionally, the subrecipient may be a private for profit or not for profit entity. For these types of recipients, the provisions set forth in Roman Numeral II, below, shall apply. Although EPA and the State remain responsible for ensuring subrecipients' compliance with the wage rate requirements set forth herein, those subrecipients shall have the primary responsibility to maintain payroll records as described in Section II-3(ii)(A), below and for compliance as described in Section II-5.

I. Requirements under FY 2010 Appropriations For Subrecipients That Are Governmental Entities:

The following terms and conditions specify how recipients will assist EPA in meeting its DB responsibilities when DB applies to EPA awards of financial assistance under the FY 2010 Appropriations with respect to State recipients and subrecipients that are governmental entities. If a subrecipient has questions regarding when DB applies, obtaining the correct DB wage determinations, DB provisions, or compliance monitoring, it may contact the State recipient. If a State recipient needs guidance, the recipient may contact **(insert name or organizational unit Regional EPA DB contact)** for guidance. The recipient or subrecipient may also obtain additional guidance from DOL's web site at <http://www.dol.gov/esa/whd/recovery/>

1. Applicability of the Davis- Bacon (DB) prevailing wage requirements.

Under the FY 2010 Appropriation, Davis-Bacon prevailing wage requirements apply to the construction, alteration, and repair of treatment works carried out in whole or in part with assistance made available by a State water pollution control revolving fund and to any construction project carried out in whole or in part by assistance made available by a drinking water treatment revolving loan fund. If a subrecipient encounters a unique situation at a site that presents uncertainties regarding DB applicability, the subrecipient must discuss the situation with the recipient State before authorizing work on that site.

2. Obtaining Wage Determinations.

(a) Subrecipients shall obtain the wage determination for the locality in which a covered activity subject to DB will take place prior to issuing requests for bids, proposals, quotes or other methods for soliciting contracts (solicitation) for activities subject to DB. These wage determinations shall be incorporated into solicitations and any subsequent contracts. Prime contracts must contain a provision requiring that subcontractors follow the wage determination incorporated into the prime contract.

- (i) While the solicitation remains open, the subrecipient shall monitor www.wdol.gov weekly to ensure that the wage determination contained in the solicitation remains current. The subrecipients shall amend the solicitation if DOL issues a modification more than 10 days prior to the closing date (i.e. bid opening) for the solicitation. If DOL modifies or supersedes the applicable wage determination less than 10 days prior to the closing date, the subrecipients may request a finding from the State recipient that there is not a reasonable time to notify interested contractors of the modification of the wage determination. The State recipient will provide a report of its findings to the subrecipient.
- (ii) If the subrecipient does not award the contract within 90 days of the closure of the solicitation, any modifications or supersedes DOL makes to the wage determination contained in the solicitation shall be effective unless the State recipient, at the request of the subrecipient, obtains an extension of the 90 day period from DOL pursuant to 29 CFR 1.6(c)(3)(iv). The subrecipient shall monitor www.wdol.gov on a weekly basis if it does not award the contract within 90 days of closure of the solicitation to ensure that wage determinations contained in the solicitation remain current.

(b) If the subrecipient carries out activity subject to DB by issuing a task order, work assignment or similar instrument to an existing contractor (ordering instrument) rather than by publishing a solicitation, the subrecipient shall insert the appropriate DOL wage determination from www.wdol.gov into the ordering instrument.

(c) Subrecipients shall review all subcontracts subject to DB entered into by prime contractors to verify that the prime contractor has required its subcontractors to include the applicable wage determinations.

(d) As provided in 29 CFR 1.6(f), DOL may issue a revised wage determination applicable to a subrecipient's contract after the award of a contract or the issuance of an ordering instrument if DOL determines that the subrecipient has failed to incorporate a wage determination or has used a wage determination that clearly does not apply to the contract or ordering instrument. If this occurs, the subrecipient shall either terminate the contract or ordering instrument and issue a revised solicitation or ordering instrument or incorporate DOL's wage determination retroactive to the beginning of the contract or ordering instrument by change order. The subrecipient's contractor must be compensated for any increases in wages resulting from the use of DOL's revised wage determination.

3. Contract and Subcontract provisions.

(a) The Recipient shall insure that the subrecipient(s) shall insert in full in any contract in excess of \$2,000 which is entered into for the actual construction, alteration and/or repair, including painting and decorating, of a treatment work under the CWSRF or a construction project under the DWSRF financed in whole or in part from Federal funds or in accordance with guarantees of a Federal agency or financed from funds obtained by pledge of any contract of a Federal agency to make a loan, grant or annual contribution (except where a different meaning is expressly indicated), and which is subject to the labor standards provisions of any of the acts listed in § 5.1 or the FY 2010 appropriation , the following clauses:

(1) Minimum wages.

(i) All laborers and mechanics employed or working upon the site of the work will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (a)(1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in § 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph (a)(1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

Subrecipients may obtain wage determinations from the U.S. Department of Labor's web site, www.dol.gov.

(ii)(A) The subrecipient(s), on behalf of EPA, shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The State award official shall approve a request for an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(2) The classification is utilized in the area by the construction industry; and

(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the subrecipient(s) agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), documentation of the action taken and the request, including the local wage determination shall be sent by the subrecipient (s) to the State award official. The State award official will transmit the request, to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210 and to the EPA DB Regional Coordinator concurrently. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification request within 30 days of receipt and so advise the State award official or will notify the State award official within the 30-day period that additional time is necessary.

(C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the subrecipient(s) do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the award official shall refer the request and the local wage determination, including the views of all interested parties and the recommendation of the State award official, to the Administrator for determination. The request shall be sent to the EPA DB Regional Coordinator concurrently. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt of the request and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs (a)(1)(ii)(B) or (C) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the

contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

(2) Withholding. The subrecipient(s), shall upon written request of the EPA Award Official or an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the (Agency) may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

(3) Payrolls and basic records.

(i) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii)(A) The contractor shall submit weekly, for each week in which any contract work is performed, a copy of all payrolls to the subrecipient, that is, the entity that receives the sub-grant or loan from the State capitalization grant recipient. Such documentation shall be available on request of the State recipient or EPA. As to each payroll copy received, the subrecipient shall provide written confirmation in a form satisfactory to the State indicating whether or not the project is in compliance with the requirements of 29 CFR 5.5(a)(1) based on the most recent payroll copies for the specified week. The payrolls shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on the weekly payrolls. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at <http://www.dol.gov/esa/whd/forms/wh347instr.htm> or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the subrecipient(s) for transmission to the State or EPA if requested by EPA, the State, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the subrecipient(s).

(B) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be provided under § 5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under § 5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

(2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph (a)(3)(ii)(B) of this section.

(D) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under paragraph (a)(3)(i) of this section available for inspection, copying, or transcription by authorized representatives of the State, EPA or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the Federal agency or State may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

(4) Apprentices and trainees--

(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the

apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

(5) Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

(6) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as the EPA determines may be appropriate, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for

the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

(7) Contract termination; debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

(8) Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

(9) Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and Subrecipient(s), State, EPA, the U.S. Department of Labor, or the employees or their representatives.

(10) Certification of eligibility.

(i) By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

4. Contract Provision for Contracts in Excess of \$100,000.

(a) Contract Work Hours and Safety Standards Act. The subrecipient shall insert the following clauses set forth in paragraphs (a)(1), (2), (3), and (4) of this section in full in any contract in an amount in excess of \$100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by Item 3, above or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

(1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such

laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

(2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (a)(1) of this section the contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (a)(1) of this section, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (a)(1) of this section.

(3) Withholding for unpaid wages and liquidated damages. The subrecipient, upon written request of the EPA Award Official or an authorized representative of the Department of Labor, shall withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (b)(2) of this section.

(4) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (a)(1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (a)(1) through (4) of this section.

(b) In addition to the clauses contained in Item 3, above, in any contract subject only to the Contract Work Hours and Safety Standards Act and not to any of the other statutes cited in 29 CFR 5.1, the Subrecipient shall insert a clause requiring that the contractor or subcontractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three years from the completion of the contract for all laborers and mechanics, including guards and watchmen, working on the contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. Further, the Subrecipient shall insert in any such contract a clause providing that the records to be maintained under this paragraph shall be made available by the contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the (write the name of agency) and the Department of Labor, and the contractor or subcontractor will permit such representatives to interview employees during working hours on the job.

5. Compliance Verification

- (a) The subrecipient shall periodically interview a sufficient number of employees entitled to DB prevailing wages (covered employees) to verify that contractors or subcontractors are paying the appropriate wage rates. As provided in 29 CFR 5.6(a)(6), all interviews must be conducted in confidence. The subrecipient must use Standard Form 1445 (SF 1445) or equivalent documentation to memorialize the interviews. Copies of the SF 1445 are available from EPA on request.
- (b) The subrecipient shall establish and follow an interview schedule based on its assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. At a minimum, the subrecipient should conduct interviews with a representative group of covered employees within two weeks of each contractor or subcontractor's submission of its initial weekly payroll data and two weeks prior to the estimated completion date for the contract or subcontract. Subrecipients must conduct more frequent interviews if the initial interviews or other information indicates that there is a risk that the contractor or subcontractor is not complying with DB . Subrecipients shall immediately conduct necessary interviews in response to an alleged violation of the prevailing wage requirements. All interviews shall be conducted in confidence.
- (c) The subrecipient shall periodically conduct spot checks of a representative sample of weekly payroll data to verify that contractors or subcontractors are paying the appropriate wage rates. The subrecipient shall establish and follow a spot check schedule based on its assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. At a minimum, if practicable, the subrecipient should spot check payroll data within two weeks of each contractor or subcontractor's submission of its initial payroll data and two weeks prior to the completion date the contract or subcontract . Subrecipients must conduct more frequent spot checks if the initial spot check or other information indicates that there is a risk that the contractor or subcontractor is not complying with DB. In addition, during the examinations the subrecipient shall verify evidence of fringe benefit plans and payments thereunder by contractors and subcontractors who claim credit for fringe benefit contributions.
- (d) The subrecipient shall periodically review contractors and subcontractors use of apprentices and trainees to verify registration and certification with respect to apprenticeship and training programs approved by either the U.S Department of Labor or a state, as appropriate, and that contractors and subcontractors are not using disproportionate numbers of, laborers, trainees and apprentices. These reviews shall be conducted in accordance with the schedules for spot checks and interviews described in Item 5(b) and (c) above.

(e) Subrecipients must immediately report potential violations of the DB prevailing wage requirements to the EPA DB contact listed above and to the appropriate DOL Wage and Hour District Office listed at <http://www.dol.gov/esa/contacts/whd/america2.htm>.

II. Requirements under FY 2010 Appropriations Act For Subrecipients That Are Not Governmental Entities

The following terms and conditions specify how recipients will assist EPA in meeting its DB responsibilities when DB applies to EPA awards of financial assistance under the FY2010 Appropriations Act with respect to subrecipients that are not governmental entities. If a subrecipient has questions regarding when DB applies, obtaining the correct DB wage determinations, DB provisions, or compliance monitoring, it may contact the State recipient for guidance. If a State recipient needs guidance, the recipient may contact (insert name or organizational unit Regional EPA DB contact) for guidance. The recipient or subrecipient may also obtain additional guidance from DOL's web site at <http://www.dol.gov/esa/whd/recovery/>

Under these terms and conditions, the subrecipient must submit its proposed DB wage determinations to the State recipient for approval prior to including the wage determination in any solicitation, contract task orders, work assignments, or similar instruments to existing contractors.

1._ Applicability of the Davis- Bacon (DB) prevailing wage requirements.

Under the FY 2010 Appropriation, Davis-Bacon prevailing wage requirements apply to the construction, alteration, and repair of treatment works carried out in whole or in part with assistance made available by a State water pollution control revolving fund and to any construction project carried out in whole or in part by assistance made available by a drinking water treatment revolving loan fund. If a subrecipient encounters a unique situation at a site that presents uncertainties regarding DB applicability, the subrecipient must discuss the situation with the recipient State before authorizing work on that site.

2. Obtaining Wage Determinations.

(a) Subrecipients must obtain proposed wage determinations for specific localities at www.wdol.gov. After the Subrecipient obtains its proposed wage determination, it must submit the wage determination to (insert contact information for State recipient DB point of contact for wage determination) for approval prior to inserting the wage determination into a solicitation, contract or issuing task orders, work assignments or similar instruments to existing contractors (ordering instruments unless subsequently directed otherwise by the State recipient Award Official).

(b) Subrecipients shall obtain the wage determination for the locality in which a covered activity subject to DB will take place prior to issuing requests for bids, proposals, quotes or other methods for soliciting contracts (solicitation) for activities subject to DB. These

wage determinations shall be incorporated into solicitations and any subsequent contracts. Prime contracts must contain a provision requiring that subcontractors follow the wage determination incorporated into the prime contract.

- (i) While the solicitation remains open, the subrecipient shall monitor www.wdol.gov on a weekly basis to ensure that the wage determination contained in the solicitation remains current. The subrecipients shall amend the solicitation if DOL issues a modification more than 10 days prior to the closing date (i.e. bid opening) for the solicitation. If DOL modifies or supersedes the applicable wage determination less than 10 days prior to the closing date, the subrecipients may request a finding from the State recipient that there is not a reasonable time to notify interested contractors of the modification of the wage determination. The State recipient will provide a report of its findings to the subrecipient.
- (ii) If the subrecipient does not award the contract within 90 days of the closure of the solicitation, any modifications or supersedes DOL makes to the wage determination contained in the solicitation shall be effective unless the State recipient, at the request of the subrecipient, obtains an extension of the 90 day period from DOL pursuant to 29 CFR 1.6(c)(3)(iv). The subrecipient shall monitor www.wdol.gov on a weekly basis if it does not award the contract within 90 days of closure of the solicitation to ensure that wage determinations contained in the solicitation remain current.

(c) If the subrecipient carries out activity subject to DB by issuing a task order, work assignment or similar instrument to an existing contractor (ordering instrument) rather than by publishing a solicitation, the subrecipient shall insert the appropriate DOL wage determination from www.wdol.gov into the ordering instrument.

(c) Subrecipients shall review all subcontracts subject to DB entered into by prime contractors to verify that the prime contractor has required its subcontractors to include the applicable wage determinations.

(d) As provided in 29 CFR 1.6(f), DOL may issue a revised wage determination applicable to a subrecipient's contract after the award of a contract or the issuance of an ordering instrument if DOL determines that the subrecipient has failed to incorporate a wage determination or has used a wage determination that clearly does not apply to the contract or ordering instrument. If this occurs, the subrecipient shall either terminate the contract or ordering instrument and issue a revised solicitation or ordering instrument or incorporate DOL's wage determination retroactive to the beginning of the contract or ordering instrument by change order. The subrecipient's contractor must be compensated for any increases in wages resulting from the use of DOL's revised wage determination.

3. Contract and Subcontract provisions.

(a) The Recipient shall insure that the subrecipient(s) shall insert in full in any contract in excess of \$2,000 which is entered into for the actual construction, alteration and/or repair, including painting and decorating, of a treatment work under the CWSRF or a construction project under the DWSRF financed in whole or in part from Federal funds or in accordance with guarantees of a Federal agency or financed from funds obtained by pledge of any contract of a Federal agency to make a loan, grant or annual contribution (except where a different meaning is expressly indicated), and which is subject to the labor standards provisions of any of the acts listed in § 5.1 or the FY 2010 appropriation , the following clauses:

(1) Minimum wages.

(i) All laborers and mechanics employed or working upon the site of the work, will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (a)(1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in § 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph (a)(1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

Subrecipients may obtain wage determinations from the U.S. Department of Labor's web site, www.dol.gov.

(ii)(A) The subrecipient(s), on behalf of EPA, shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage

determination. The State award official shall approve a request for an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

- (1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and
- (2) The classification is utilized in the area by the construction industry; and
- (3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the subrecipient(s) agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), documentation of the action taken and the request, including the local wage determination shall be sent by the subrecipient(s) to the State award official. The State award official will transmit the report, to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210 and to the EPA DB Regional Coordinator concurrently. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification request within 30 days of receipt and so advise the State award official or will notify the State award official within the 30-day period that additional time is necessary.

(C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the and the subrecipient(s) do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the award official shall refer the request, and the local wage determination, including the views of all interested parties and the recommendation of the State award official, to the Administrator for determination. The request shall be sent to the EPA Regional Coordinator concurrently. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt of the request and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs (a)(1)(ii)(B) or (C) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

(2) Withholding. The subrecipient(s) shall upon written request of the EPA Award Official or an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the (Agency) may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

(3) Payrolls and basic records.

(i) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii)(A) The contractor shall submit weekly, for each week in which any contract work is performed, a copy of all payrolls to the subrecipient, that is, the entity that receives the sub-grant or loan from the State capitalization grant recipient. Such documentation shall be available on request of the State recipient or EPA. As to each payroll copy received, the subrecipient shall provide written confirmation in a form satisfactory to the State indicating whether or not the project is in compliance with the requirements of 29 CFR 5.5(a)(1) based on the most recent payroll copies for the specified week. The payrolls shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on the weekly payrolls. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at <http://www.dol.gov/esa/whd/forms/wh347instr.htm> or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the subrecipient(s) for transmission to the State or EPA if requested by EPA, the State, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the subrecipient(s).

(B) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be provided under § 5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under § 5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

(2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph (a)(3)(ii)(B) of this section.

(D) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under paragraph (a)(3)(i) of this section available for inspection, copying, or transcription by authorized representatives of the State, EPA or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the Federal agency or State may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

(4) Apprentices and trainees--

(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the

apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

(5) Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

(6) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as the EPA determines may be appropriate, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for

the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

(7) Contract termination: debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

(8) Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

(9) Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and Subrecipient(s), State, EPA, the U.S. Department of Labor, or the employees or their representatives.

(10) Certification of eligibility.

(i) By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

4. Contract Provision for Contracts in Excess of \$100,000.

(a) Contract Work Hours and Safety Standards Act. The subrecipient shall insert the following clauses set forth in paragraphs (a)(1), (2), (3), and (4) of this section in full in any contract in an amount in excess of \$100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by Item 3, above or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

(1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such

laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

(2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (b)(1) of this section the contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (b)(1) of this section, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (b)(1) of this section.

(3) Withholding for unpaid wages and liquidated damages. The subrecipient shall upon the request of the EPA Award Official or an authorized representative of the Department of Labor, withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (b)(2) of this section.

(4) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (b)(1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (b)(1) through (4) of this section.

(c) In addition to the clauses contained in Item 3, above, in any contract subject only to the Contract Work Hours and Safety Standards Act and not to any of the other statutes cited in 29 CFR 5.1, the Subrecipient shall insert a clause requiring that the contractor or subcontractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three years from the completion of the contract for all laborers and mechanics, including guards and watchmen, working on the contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. Further, the Subrecipient shall insert in any such contract a clause providing that the records to be maintained under this paragraph shall be made available by the contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the (write the name of agency) and the Department of Labor, and the contractor or subcontractor will permit such representatives to interview employees during working hours on the job.

5. Compliance Verification

- (a). The subrecipient shall periodically interview a sufficient number of employees entitled to DB prevailing wages (covered employees) to verify that contractors or subcontractors are paying the appropriate wage rates. As provided in 29 CFR 5.6(a)(6), all interviews must be conducted in confidence. The subrecipient must use Standard Form 1445 (SF 1445) or equivalent documentation to memorialize the interviews. Copies of the SF 1445 are available from EPA on request.
- (b) The subrecipient shall establish and follow an interview schedule based on its assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. At a minimum, the subrecipient should conduct interviews with a representative group of covered employees within two weeks of each contractor or subcontractor's submission of its initial weekly payroll data and two weeks prior to the estimated completion date for the contract or subcontract. Subrecipients must conduct more frequent interviews if the initial interviews or other information indicates that there is a risk that the contractor or subcontractor is not complying with DB. Subrecipients shall immediately conduct necessary interviews in response to an alleged violation of the prevailing wage requirements. All interviews shall be conducted in confidence.
- (c). The subrecipient shall periodically conduct spot checks of a representative sample of weekly payroll data to verify that contractors or subcontractors are paying the appropriate wage rates. The subrecipient shall establish and follow a spot check schedule based on its assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. At a minimum, if practicable the subrecipient should spot check payroll data within two weeks of each contractor or subcontractor's submission of its initial payroll data and two weeks prior to the completion date the contract or subcontract. Subrecipients must conduct more frequent spot checks if the initial spot check or other information indicates that there is a risk that the contractor or subcontractor is not complying with DB . In addition, during the examinations the subrecipient shall verify evidence of fringe benefit plans and payments thereunder by contractors and subcontractors who claim credit for fringe benefit contributions.
- (d). The subrecipient shall periodically review contractors and subcontractors use of apprentices and trainees to verify registration and certification with respect to apprenticeship and training programs approved by either the U.S Department of Labor or a state, as appropriate, and that contractors and subcontractors are not using disproportionate numbers of, laborers, trainees and apprentices. These reviews shall be conducted in accordance with the schedules for spot checks and interviews described in Item 5(b) and (c) above.

(e) Subrecipients must immediately report potential violations of the DB prevailing wage requirements to the EPA DB contact listed above and to the appropriate DOL Wage and Hour District Office listed at <http://www.dol.gov/esa/contacts/whd/america2.htm>.

APPENDIX D

ADEC Standard “Monitoring Well Guidance,” September 2013

ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION

DIVISION OF SPILL PREVENTION AND RESPONSE CONTAMINATED SITES PROGRAM



Monitoring Well Guidance

September 2013

MONITORING WELL GUIDANCE

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Applicability

This document fulfills the regulatory requirements of 18 AAC 75 and 18 AAC 78 for monitoring well design, construction, installation, maintenance, and decommissioning. The Alaska Department of Environmental Conservation (ADEC) recommends that staff and third party consultants use this document in place of the April 1992 guidance titled *Recommended Practices for Monitoring Well Design, Installation and Decommissioning*, adopted by reference in 18 AAC 75 and 78.

The practices described in this document are not applicable to all situations; the department recognizes that regional, climatic, and geographic variables can influence monitoring well design and construction. While each monitoring well installation may differ, site-specific application should be technically sound. This document is applicable to all groundwater monitoring wells including drilled wells, direct push wells, and excavation installed wells.

Introduction

This document presents standards for the location, design, installation, decommissioning, and documentation of monitoring wells and well points for piezometers and transducers associated with the investigation and cleanup of contaminated sites in Alaska. The goal is to obtain reliable and representative information regarding aquifer characteristics, groundwater flow directions, groundwater chemical and physical characteristics, and groundwater samples. Generally, the purpose of a monitoring well is to document the presence or absence of contamination or establish long-term groundwater contaminant trends and to confirm that cleanup levels have been met in a known contaminated aquifer.

Monitoring wells fall into two categories, long term and short term. Short term monitoring wells are installed to evaluate the presence or absence of contamination and are intended for sampling once, unless otherwise approved by ADEC. Long term monitoring wells are intended for multiple sampling events. Short term monitoring wells may or may not have a filter pack, interstitial seal or surface seal, depending on their application. Whereas, long term monitoring wells must have a filter pack, interstitial seal and surface seal, unless otherwise approved by ADEC. All short term and long term monitoring wells, including well points for piezometers and transducers, must be decommissioned in accordance with this document.

Investigation of a contaminated site requires establishing clearly defined objectives before fieldwork commences. Identifying the type of contaminant and the manner of release to the environment is a primary step. Contaminant releases to land require an understanding of partitioning between the hazardous substance released, and soil, water, and air or soil gas. Water often acts as a carrier for contaminants as they move through the soil. If contaminant migration results in groundwater contamination, monitoring wells are required to assess groundwater quality. The installation, development, and decommissioning of monitoring wells and well points must be done in accordance with this guidance document, or other methods approved by ADEC (18 AAC 75.345(j)).

Before installing a monitoring well or a well point, ADEC recommends developing a conceptual model of the site geology and hydrology. The purpose of a hydrogeologic conceptual model is to estimate the distribution of the predominant geologic units and flow conditions at the site. The conceptual model may include estimates of the distribution of aquifer(s) and aquitards at or near the site, hydrologic boundaries, the water table surface, and other pertinent hydrogeologic properties. The hydrogeologic conceptual model should be updated with new data as it is obtained.

This guidance document includes the basic steps for recording a vertical soil profile, advancement of soil borings, design and installation of a monitoring well, well development, and well decommissioning. The references titled *Handbook of Suggested Practices for the Design and Installation of Ground-Water Monitoring Wells*, EPA/600/4-89/034 (hereafter referred to as EPA, 1991), and American Society for Testing and Materials (ASTM) D5092-04e1 *Standard Practice for Design and*

Installation of Groundwater Monitoring Wells (2005) provide more comprehensive guidance.

General Guidelines for Monitoring Well Design and Installation

This section provides broad guidelines for monitoring well construction and features. Not all of these guidelines will be pertinent to every type of monitoring well. Subsequent sections of this guidance provide detailed instructions on design and installation of specific types of wells.

Key Principals, Specifications, and Precautions

1. Determine the purpose of the well.
2. Evaluate site-specific hydrogeologic information from all available sources, including the physical and chemical properties of the groundwater and any contaminants known or suspected to be present in the groundwater.
3. Develop a conceptual hydrogeologic model of the site.
4. Determine screened interval.
5. Select method of monitoring well installation.
6. Determine the diameter of the well.

Discussion

Groundwater monitoring serves several purposes, such as ambient monitoring, source monitoring, case preparation monitoring, and research monitoring (Barcelona et al., 1985). Wells installed for each of these purposes must satisfy different requirements, and may require different strategies for well design and installation. Prior to design and installation there should be a clear understanding of what the monitoring program is intended to accomplish. Is the monitoring well intended for site characterization or plume delineation, long term monitoring, contaminant screening, final compliance with cleanup standards for site closure, product recovery or a remedial action, or some other purpose?

Selection of monitoring well type, materials, and installation method is a site-specific determination. Site logistics and economics often influence choices. Locations without road access can be logistically challenging and incur increased project costs for site investigation. In all cases, clearly identify project objectives in a work plan developed in consultation with ADEC.

Proper well spatial and vertical location is critical to ensure accurate monitoring of the groundwater flow regime. Monitoring wells and well points are typically installed in the uppermost permeable water-bearing zone under or adjacent to a regulated facility or potential source of contamination. Consider natural, seasonal, and anthropogenic fluctuations in water table elevation in determining the well location. Natural fluctuations are typically due to infiltration of snowmelt or precipitation, proximity to rivers with seasonal high water levels, or tidal fluctuations. Anthropogenic fluctuations

can result from pumping, wastewater disposal, or paving to decrease infiltration rates. Consider the behavior of a contaminant plume over distance to ensure that placement and construction of monitoring wells is appropriate (Wiedemeier et al., 1999).

Well design and installation must be appropriate to ensure that groundwater samples and water level measurements characterize discrete stratigraphic intervals. Location of the screened interval relative to the water table elevation may influence sampling results. For example, a well screened at the water table, with some screen above the water table and some below the water table, will intercept floating petroleum product; a well with the top of the screened interval located below the water table will not intercept floating petroleum product under static conditions.

Well design and installation must prevent the introduction of surface contaminants into the groundwater and prevent leakage of groundwater or contaminants between stratigraphic intervals in the well bore or along the well annulus. If the well leaks, correct the leak or decommission the well. Do not install monitoring wells in locations where they are subject to periodic or seasonal inundation by floodwaters, unless the well has special watertight construction. Protect monitoring wells from loss of integrity by soil erosion, soil settlement, shrink-swell soil conditions, frost heaving of soils, damage by vehicles or heavy equipment, and other site-specific hazards. Completion of monitoring wells at- or below -grade is less preferable than above-grade completions due to the potential for surface water infiltrating the monitoring well casing.

A drilled, long-term monitoring well is generally composed of well casing, well screen, and filter pack ([Figure 1](#)). Construct monitoring wells with new materials that will not physically, chemically, or biologically affect the groundwater quality, or be deleteriously affected by the subsurface environment. The well screen is an intake where groundwater can flow into the well; the filter pack surrounds the well screen. Install the well in an open borehole created by advancing a soil boring, usually with a hollow-stem auger drill rig. Advance the soil boring until the soil core (s) demonstrates saturated soil conditions, indicating that the groundwater table has been encountered. After the water table has been identified in the soil boring, remove the drill rods from the open borehole and install the monitoring well.

Survey monitoring wells vertically and horizontally. Survey the top of the well casing and ground surface for use as a reference point to determine water-level elevations and sampling depths and to evaluate groundwater flow direction. All survey data must be recorded in the field notes and submitted with the report. The location survey must achieve a horizontal accuracy of 1.0 feet, and the elevation surveys must achieve a vertical accuracy of 0.01 foot. Sites undergoing contaminant assessment monitoring must have the wells surveyed as described above, and re-survey monitoring wells every year, unless otherwise approved by ADEC on a site-specific basis. Based on site conditions ADEC may require that a survey be completed by a registered professional surveyor or registered professional engineer.

For accurate water level measurements, permanently mark the monitoring well with a reference point on the actual monitoring well casing, not the outer surface casing. Permanently attach a facility or project-unique identification number on the inner and outer well casings. All well construction logs with soil boring information are required to be submitted to the Alaska Department of Natural Resources Division of Mining Land and Water in accordance with 11 AAC 93.140(g).

Also, submit documentation of the well design, well construction logs, and the materials used to ADEC. This information is useful for determining if the monitoring well design, installation, or history may be affecting sampling results or the interpretation of site conditions.

Construction Procedures

Key Principals, Specifications, and Precautions

1. Properly decontaminate well construction materials prior to installation.
2. Prevent contamination when joining casings and attaching the screen.
3. For long-term monitoring wells, place the filter pack into the annulus to a minimum of two feet above the top of the screen and one foot beneath the well end cap.
4. Use bottom caps or end plugs.
5. Use permanent or temporary surface casing if contamination or sloughing is a potential issue (drill augers should never be removed from the hole without concurrently filling borehole voids with appropriate sealant media).
6. For long-term monitoring wells, reduce the required filter pack height to allow for annular space sealant.
7. For long-term monitoring wells following installation, “sound” the filter pack for proper placement.
8. For long-term monitoring wells apply grout or bentonite chips to seal the annular space.
9. If the borehole or monitoring well is advanced through an aquitard, the penetration through the aquitard must be sealed at the same interval using grout or bentonite chips, unless otherwise approved by ADEC.
10. For all wells, pour grouts or slurries freely with or without the use of a tremie pipe.
11. Take appropriate precautions during drilling to avoid introducing contaminants into the well. Prevent vertical movement of water or contaminants between water-bearing zones in either the boring or the well annulus.
12. Avoid using drilling mud, synthetic drilling fluids, or petroleum- or metal-based pipe joint compounds and other potential contaminants unless necessary.
13. If it is necessary to add water during drilling, use only potable water and first identify the water source.
14. If it is necessary to add drilling mud to stabilize the hole or control down-hole fluid losses, use only high yield sodium bentonite clay free of all organic polymer additives.

15. Properly decontaminate all equipment placed into the well by steam cleaning, high-pressure hot water, or similar methods between well installations.
16. Manage cuttings, or water, removed from the well in accordance with 18 AAC 75 or 18 AAC 78.
17. Complete an “as built” drawing/schematic for each constructed monitoring well.
18. Survey wells vertically and horizontally with survey loops that close within 0.01 foot vertically, and 1.0 feet horizontally. The well survey data must be provided to ADEC in a written report. Submit a record of the well design, installation, and the materials used to ADEC.
19. Install a cement or asphalt surface seal, where appropriate.

Discussion

Design and install monitoring wells and well points under the direct supervision of a geologist, engineer, or other professional with direct experience in the design and installation of monitoring wells and well points.

Properly decontaminate well casing and screen materials with detergent before use (EPA, 1991), unless the casing and screen have been factory cleaned and wrapped in protective plastic sheathing and the integrity of the protective sheathing has been maintained up to the point of installation. Well construction begins with lowering a screened section connected to a section of casing into the open borehole. Care should be taken while joining the casings and attaching the screen to prevent contamination. Center the monitoring well and well screen in the borehole, then pour the filter pack into the annulus surrounding the well screen to a height of no less than two feet above the top of screen and one foot beneath the well end cap. Use centering guides to center the well screen in the borehole in deeper wells. Use bottom caps or end plugs on all monitoring wells.

Use permanent or temporary surface casing during well drilling and installation in all cases where: 1) contaminated groundwater could migrate in the borehole by gravity flow or under artesian pressure into other water-bearing zones, and 2) the formations penetrated have a tendency to slough or cave into the borehole and affect filter pack and annular seal placement or integrity.

For long-term monitoring wells, unless using pre-packed filters, place the filter pack using a method that ensures positive placement opposite the well screen without bridging or size segregation of the filter pack material. If necessary, reduce the required filter pack height above the top of the well screen to six inches to allow for placement of the required volume of annular space sealant.

As the auger flights are retrieved, installers should continually measure the depth to the top of the sand pack to ensure it extends two feet above the screened intake. Following the filter pack installation, the top of the filter pack should be checked for proper placement. Place a finer-grained sand filter six inches to two feet thick at the top of the filter pack and below the annular seal to help prevent infiltration of bentonite into the filter pack. Above the filter pack, install the annular seal to protect the well intake.

Lastly, fill the annular space above the seal with grout or bentonite chips or inert material, as discussed above.

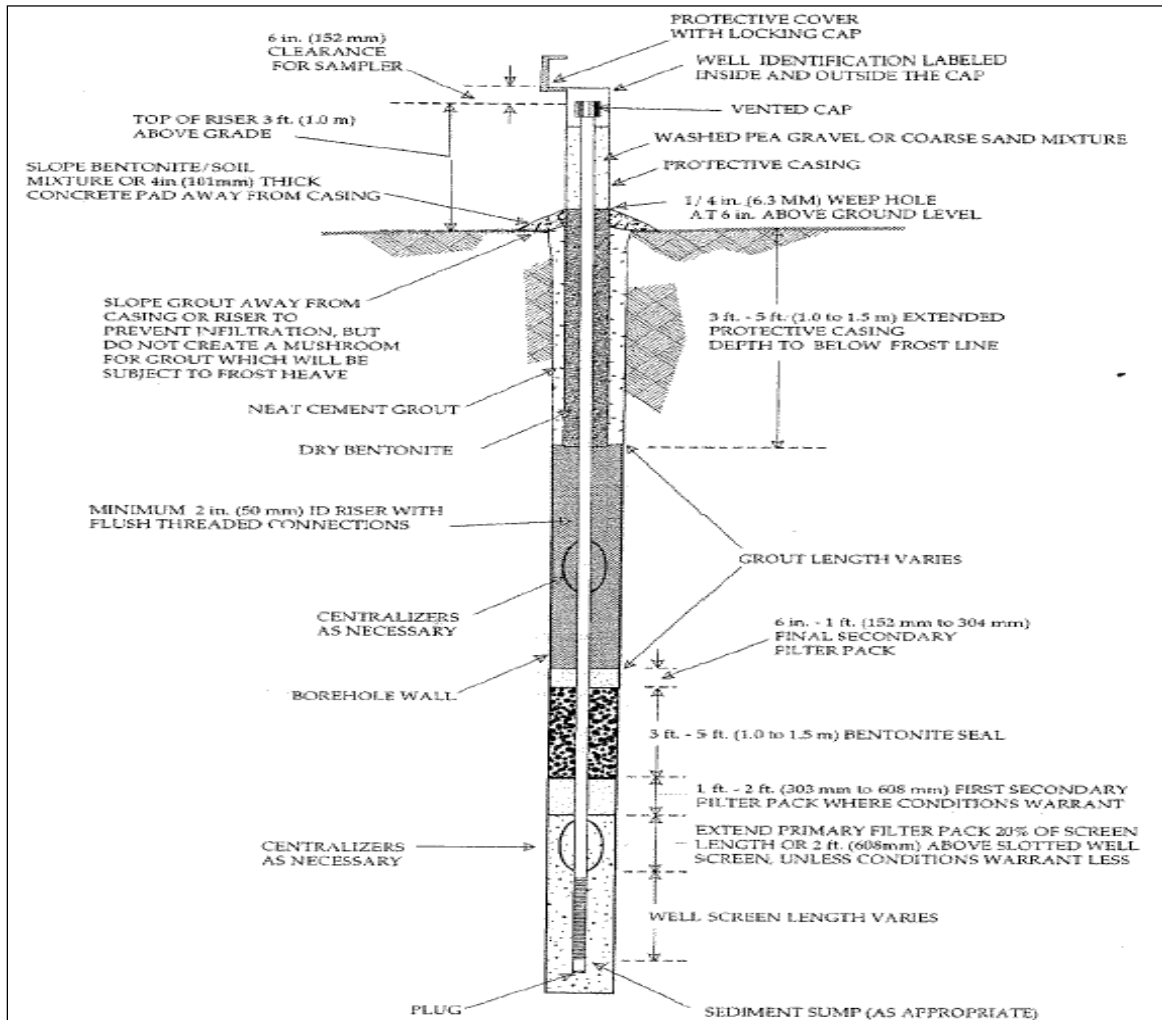


Figure 1. Example monitoring well construction design with filter pack. From ASTM 5092 (2005)¹.

Well Casing

Key Principals, Specifications, and Precautions

1. Determine the appropriate casing material for the application.
2. Determine the proper casing length and diameter.
3. Join casing sections properly.

Discussion

The casing should be non-reactive with the subsurface environment and any contaminant the monitoring well may encounter. Casing length is determined based on the borehole

¹ Extracted, with permission, from the D5092-04e1 Standard Practice for Design and Installation of Groundwater Monitoring Wells, copyright ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428. A copy of the complete standard is available ASTM (www.astm.org).

depth and the data quality objectives on a site-specific basis. Join casing sections together with threads and couplings or solvent welds, rather than glues, in order to eliminate the introduction of contaminants when sampling. Threaded connections should have o-rings to complete the seal, and casings should be flush-fit on the inside. Casing diameter is also determined on a site-specific basis. The inside diameter of the well casing should be at least 1.9 inches, with the exception of well points for piezometers, and transducers. Monitoring wells in Alaska are commonly schedule 40 polyvinyl chloride (PVC), nominal 2-inch diameter casing. Deep wells, product recovery wells, or those that need larger-sized, dedicated pumps or tubing may require 4-, 6-, or 8-inch casings. See [Figure 2](#) for a table of the inner diameters of various well casing schedules.

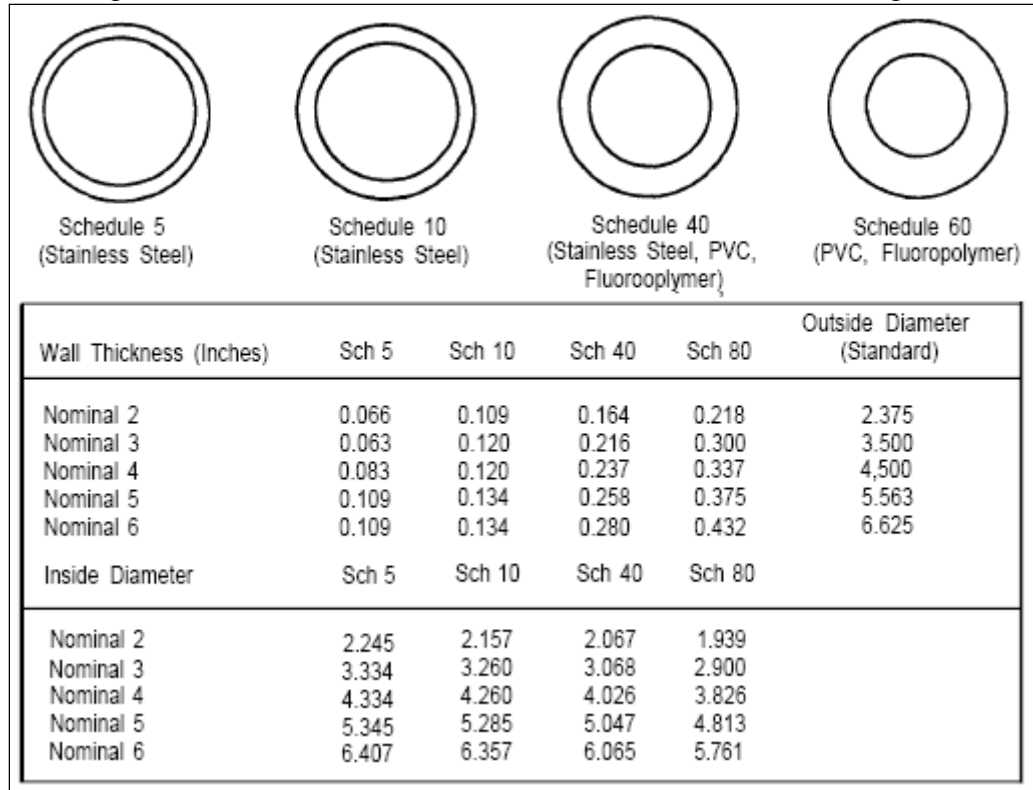


Figure 2. Casing thickness and diameter for monitoring well materials. From EPA (1991).

There are many different casing materials used in the design of a monitoring well; however, thermoplastic materials (such as PVC) and stainless steel are the most widely used. PVC is commonly used because of its high strength, low maintenance, and chemical resistance. EPA (1991) discusses special applications to monitoring wells for materials other than PVC. All monitoring well materials should conform to ASTM Standards.

Consider chemical resistance/interference during monitoring well design; many well materials may react with the groundwater, resulting in poor or erroneous data. EPA (1991) and Driscoll (1986) offer in-depth discussion of the limitations of each material. In most cases in Alaska, PVC will provide a durable monitoring well with good chemical resistance (EPA, 1991, page 79).

When choosing monitoring well and well point casing material, three parameters determine its strength: tensile, compressive, and collapse strength. Poor tensile and collapse strength are the main drivers for failure. The tensile strength of the casing joints is critical because the joint is typically the weakest point in a casing string. Tensile forces are generally greatest on a dry string of casing hung in the open boring hole during installation. See [Figure 3](#) for illustration of these forces on the well casing.

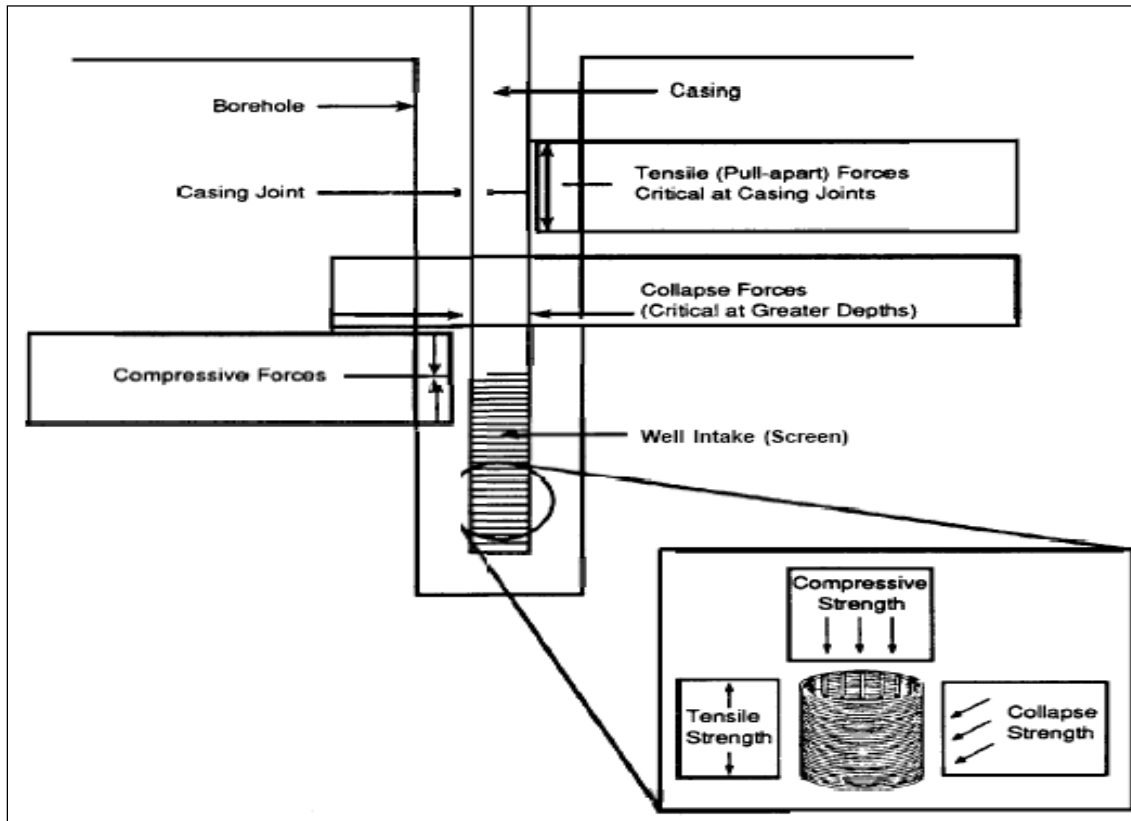


Figure 3. Forces acting on a monitoring well casing during installation. EPA (1991).

The outside diameter and wall thickness determines the resistance of casing to collapse. Casing collapse strength is directly proportional to the cube of the wall thickness. Therefore, a small increase in wall thickness provides a substantial increase in collapse strength. Properly installed casing, supported by the filter pack and annular seal, seldom leads to collapse (National Water Well Association and Plastic Pipe Institute, 1981).

Freeze-thaw processes creating “frost heaving” can “jack” wells from the ground, due to freezing and upward expansion of the soil. Frost heaving will change the height of the well casing, and in some cases overcome the tensile strength of the casing joint and separate casing sections. Minimize damage by installing a surface outer casing to a depth of 5-10 feet below ground surface and a steeply inclined cement cap around the surface casing (Driscoll, 1986). When frost heaving occurs and pressure is exerted on the cement cap, the surface casing may rise without affecting the monitoring well casing (Driscoll,

1986). More information about frost heave and frost heave susceptible soils is available in ASTM standard D5918 (2001).

Filter Pack

Key Principals, Specifications, and Precautions

1. Determine the appropriate filter pack application (natural or artificial).
2. Use clean, chemically inert, and well-rounded siliceous material.
3. Determine appropriate filter pack thickness (2-8 inches).
4. Extend filter pack at least two feet above well screen.

Discussion

Surrounding the monitoring well intake with materials that are coarser, of uniform grain size, and have a higher permeability than natural formation material allows groundwater to flow freely into the well from adjacent formation material while minimizing or eliminating the entrance of fine-grained materials. Typically, installing an artificial filter pack meets these objectives. Alternatively, develop a natural well where the formation consists of suitable material that does not require a filter pack. Deciding between these two options depends on the grain-size distribution of the natural formation materials in the monitored zone. Grain size distribution can be determined by conducting a sieve analysis of a sample collected from the intended screened interval. Naturally developed wells can be used when the maximum borehole diameter closely approximates the outside diameter of the well, and when the surrounding formation is coarse-grained and permeable (EPA, 1991). Size the filter pack for wells installed in unconsolidated material to retain most of the surrounding formation. However, most monitoring wells installed in Alaskan unconsolidated soils are artificially filter-packed, typically with a No.10-20 or 20-40 silica sand pack. Artificial filter pack is more appropriate to use under the following circumstances (EPA, 1991).

- Natural formation is uniformly fine grained
- Long screened interval required and/or the intake spans highly variable lithology
- Formation is a poorly cemented sandstone
- Formation consists of fractured rock or karst
- Formation consists of shales or coals that will act as a constant supply of turbidity
- Borehole diameter is significantly greater than the screen

The filter pack should extend above the well screen to a length of 20% of the well screen length, but no less than 2 feet (ASTM D5092, 2005). The thickness of the filter pack should be at least 2 inches between the borehole and the well screen, and no greater than 8 inches (EPA, 1991).

The filter pack should consist of clean, chemically inert, and well-rounded siliceous material. Do not use crushed limestone or dolomite, material containing clay, or filter fabrics. The sand or gravel used for filter packs should be of uniform size, hard and durable, and should have an average specific gravity of 2.50 or greater. The sand and

gravel should be well washed and free of clay, dust, and organic matter. Not more than five percent of the sand or gravel should be soluble in hydrochloric acid. Additional information regarding the filter pack is provided in EPA (1991), ASTM D5092 (2002), and Driscoll (1986).

Well Intake

Key Principals, Specifications, and Precautions

1. Determine the proper slot size (intake opening) based on the selected filter pack.
2. Ensure the screen retains at least 90% of the filter pack.
3. Use commercially manufactured well intakes only.
4. Account for resistance to corrosion and chemical degradation.
5. Determine the proper well screen length; minimize screen length to avoid dilution during sampling.
6. Install well clusters as individual wells in close proximity.

Discussion

The well intake is the aquifer access location. Except for wells in bedrock, install well screens in all monitoring wells.

Determine the slot size for the screened section based upon the filter pack selected for the monitoring well, as discussed above. Select the appropriate screen slot size by sieve analysis of the formation material in which the well screen will be positioned. The screen should be capable of retaining at least 90% of the filter pack. However, this step is laborious, and may be bypassed if the site is understood well enough from previous investigation. Typical installations in Alaska for unconsolidated soil use a 20-slot intake with a No. 10-20 silica sand pack, or 10-slot intake with a No. 20-40 silica sand pack. Commercially manufactured well intakes are required for use in monitoring wells because commercial manufacturers follow stricter quality control measures. All wells require machine slotted well screens. Do not use hand cut screens.

Screened interval location relative to the water table elevation can influence sample results. Increased open area in the monitoring well intake allows effective development and easy flow of water from the formation into the well. The type of well intake and slot size controls the amount of open area in a well intake (EPA, 1991). Consider water table variations, site stratigraphy, expected contaminant behavior, and groundwater flow when selecting the screen length and position in the borehole. When existing contamination is suspected or known, down-hole geophysical techniques or groundwater sampling may be necessary to aid in selecting the location of the screened interval.

Determine the well screen length on a site-specific basis and project objectives. Minimize the length of well screens to avoid dilution during sampling. Well screens typically measure one (1) to 10 feet in length, and only rarely equal or exceed 20 feet in length (EPA, 1991). For conventional monitoring wells at petroleum-contaminated sites in Alaska, the well screen length is typically ten (10) feet long and placed with some well

screen above the high water table. However, there are several instances where this convention is not appropriate (API, 2006). A short-screened interval will provide data from a specific discrete interval, whereas a long screen length accounts for water table fluctuations and the inherent variability between water levels during and after drilling. However, this application may result in composite groundwater samples, even in relatively homogeneous formations (Church and Granato, 1996; Britt, 2005).

Monitoring wells installed at multiple depths to determine the vertical hydraulic or contaminant concentration gradient, also known as piezometers, are typically screened less than five feet. Install piezometers as either nested or clustered. ADEC does not recommend wells consisting of multiple aquifer completions in a single borehole. Well clusters should consist of individual wells in close proximity, screened at varying depths, each installed in its own borehole. For well clusters, drill the deepest well in the cluster first. Use borehole sampling information to determine what formation interval to screen, or where to place seals to prevent communication between the aquifers.

Annular Space Seals

Key Principals, Specifications, and Precautions

1. Seal the well casing to the adjacent soil formation.
2. Seal with grout, bentonite chips, or similar material at a minimum of two feet above the filter pack and two feet below the ground surface.
3. Install bentonite chips in one or two foot increments and hydrate before placing the next layer.

Discussion

Install annular seals to restrict vertical movement of water or contaminants by sealing the well casing to the adjacent soil formation. The annular seal should consist of grout or bentonite chips from the filter pack to the ground surface.

Construct all long term monitoring wells with a seal at the top of the filter pack. Install this seal to confine the well screen to the sampling interval. Extend the seal a minimum of two feet upward from the top of the filter pack to prevent seal material from leaching into the filter pack. This annular seal should consist of bentonite pellets, bentonite slurry, or similar material.

To protect the screened interval from “cross contamination” from infiltration of runoff and potential contaminants at the ground surface, install an annular seal in the annulus at the ground surface. Extend this annular seal from the ground surface to 2 -3 feet below the ground surface. For shallow wells, it is common to grout the annulus with bentonite from the annular seal above filter pack to the annular seal at the ground surface. For deeper wells, there is often inert material, typically sand, between these two seals.

EPA (1991) and ASTM 5092 (2005) discuss the properties of annular seals and grout as well as the uses. Nested or clustered wells require special care to seal off water bearing zones from cross contamination.

Well Protection

Key Principals, Specifications, and Precautions

1. Construct all long term monitoring wells with a surface monument to protect the well casing from damage. Install the concrete around the monument to slope away from the well casing so that it sheds water away from the well.
2. Install protective casings and locks for wells completed above ground.
3. For a well completed below the ground surface, install a lockable vault or equivalent.
4. Install protective guard posts, if necessary.

Discussion

If the well casing is composed of metal and completed above the ground surface, attach a lockable cap to the top of the casing. If the well is not cased with metal and completed above the ground surface, install a metal protective casing around the well. Extend the protective casing at least six inches above the top of the well casing, and at least two feet into the ground. Attach a lockable cap to the top of the protective casing. For a well completed below the ground surface, install a lockable vault or equivalent around the well. Install a protective cover, level with the ground surface, with a waterproof seal to prevent the inflow of surface water. Design the cover to withstand the maximum expected loadings.

Install guard posts for monitoring wells completed above the ground to protect the wells from damage. Guard posts should consist of three metal posts at least three inches in diameter set in concrete. Install the posts in a triangular array around the casing, and at least two feet from it. Extend the posts at least three feet above and below the ground surface. Paint the above ground portion with a bright colored paint. Other surface protection methods may be used if they meet the intent of protecting the above ground portion of a monitoring well.

Restore damaged wells with well protection measures and casing as prescribed by this chapter. Decommission wells that are damaged beyond repair.

Procedures for Specific Types of Wells

Drilled Wells

Key Principals, Specifications, and Precautions

1. Select the proper drill rig.
2. Evaluate site-specific hydrogeologic information from all available sources, including the physical and chemical properties of the groundwater and any contaminants known or suspected to be present in the groundwater.
3. Develop a conceptual hydrogeologic model of the site.
4. Determine screened interval.
5. Determine the diameter of the well.
6. Determine the proper inside diameter of the borehole (at least 4 inches larger than the riser and screen diameter).
7. Take appropriate precautions during drilling to avoid introducing contaminants into the borehole.
8. Proceed with soil recovery per the ADEC approved Work Plan.
9. Complete an “as built” drawing/schematic for each constructed monitoring well.
10. Avoid using drilling mud, synthetic drilling fluids, or petroleum- or metal-based pipe joint compounds and other potential contaminants unless necessary.
11. If it is necessary to add water to the borehole during drilling, use only potable water and first identify the water source.
12. If it is necessary to add drilling mud to the borehole during drilling to stabilize the hole or control down-hole fluid losses, use only high yield sodium bentonite clay free of all organic polymer additives.
13. Properly decontaminate all equipment placed into the borehole by steam cleaning, high-pressure hot water, or similar methods before and after use at the site and between boreholes.
14. Manage cuttings, or water, removed from the borehole in accordance with 18 AAC 75 or 18 AAC 78.
15. Survey wells vertically and horizontally with survey loops that close within 0.01 foot vertically, and 1.0 foot horizontally. The well survey data must be provided to ADEC in a written report. Submit a record of the well design, installation, and the materials used to ADEC.
16. Maintain a boring log.

Discussion

Soil borings assess the lithology of the subsurface and are often required during the installation of monitoring wells. Selection of the drill rig used to advance a soil boring (or install a groundwater monitoring well) must be appropriate to gather the project-specific data required. A common drill rig used for contaminated site investigation is the hollow-stem auger. The hollow-stem auger allows for continuous soil recovery and monitoring well installation. American Society for Testing and Materials (ASTM) standard D6151 (2003) provides detailed information on the use of hollow-stem augers for soil sampling. Direct push techniques are also popular in Alaska for advancing soil borings and installing monitoring wells. ASTM standards D6724 (2004) and D6725 (2002) provide detailed guidance on the installation of direct push monitoring wells.

Air rotary drilling techniques may be useful when drilling through consolidated materials; ASTM standard D5782 (2000) provides a detailed discussion. Additionally, comprehensive evaluations of drilling methods are in Driscoll (1986) and EPA (1991).

Soil recovery must proceed in accordance with the ADEC approved Work Plan to generate an accurate record of the soil lithology, soil moisture content, and allow for soil sample collection. Continuous soil recovery may be appropriate at some locations at some sites, depending on the objectives, goals, and data requirements.

ASTM standard D5434 (2003) provides detailed guidance on the type of information included in the boring log. An example log is in EPA (1991). If the soil boring is completed as a groundwater monitoring well, the well construction and completion information should be provided as a detailed “as-built” drawing. An example of an as-built drawing showing well construction and completion information is in EPA (1991).

When describing frozen soils, ASTM standard D4083 (2001) can be used as guidance. Rock core logs should describe the lithology, mineralogy, color, grain size, degree of cementation, degree of weathering, density and orientation of fractures, other primary and secondary features and physical characteristics of the rock, and the rock quality designation. Include a clearly labeled photographic record of all rock cores with the rock core logs.

For monitoring wells other than direct push, ADEC recommends boreholes with a minimum inside diameter at least four inches larger than the outside diameter of the riser pipe and screen. This recommendation is to allow for proper installation of materials within the annular space and to ensure an adequate annular seal.

Direct Push Wells

Key Principals, Specifications, and Precautions

1. Determine the purpose of the well.
2. Evaluate site-specific hydrogeologic information from all available sources, including the physical and chemical properties of the groundwater and any contaminants known or suspected to be present in the groundwater.
3. Develop a conceptual hydrogeologic model of the site.
4. Determine screened interval.
5. Determine the diameter of the well.
6. Take appropriate precautions during installation to avoid introducing contaminants into the well. Prevent vertical movement of water or contaminants between water-bearing zones in either the boring or the well annulus.
7. Properly decontaminate all equipment placed into the well by steam cleaning, high-pressure hot water, or similar methods between well installations.
8. Manage cuttings, or water, removed from the well in accordance with 18 AAC 75 or 18 AAC 78.
9. Complete an “as built” drawing/schematic for each constructed monitoring well.

10. Survey wells vertically and horizontally with survey loops that close within 0.01 foot vertically, and 1.0 foot horizontally. The well survey data must be provided to ADEC in a written report. Submit a record of the well design, installation, and the materials used to ADEC.
11. Maintain a boring log.

Discussion

Direct push monitoring wells have improved in technology over the last several years and have become increasingly common at contaminated site investigations. Significant cost savings can be achieved with direct push wells due to faster installation, replacement, and decommissioning. While the method of well installation and construction materials differs from traditional drilled wells, direct push wells are still subject to the considerations discussed in this guidance to yield representative groundwater samples.

The use of direct push wells varies. Direct push wells consist of a steel drive rod with a protected screen or an exposed screen. Depending on the application, direct push wells may or may not use seals and filter packs. However, direct push wells without seals and filter packs are for short term applications of one sampling event, unless otherwise approved by ADEC.

Install direct push wells using steel drive rods advanced by hydraulic hammers or rams, directly emplacing the well screen and riser, or providing subsurface access for installation of well components similar to drilled wells. These differing installations are classified as either exposed-screen or protected-screen installations (see Figure 6). In exposed screen installation, the casing and screen surrounds the drive rods, or are used as the drive rod. During installation, the well screen is directly exposed to the formation, and installation is completed without a filter pack or annular seal. In the protected-screen installation, the casing and screen are inside the drive rod, or lowered as the drive rods are advanced. The filter pack and annular seal can be installed in the protected installation as discussed above. Alternatively, pre-packed well screens and expanding foam annular seals are commonly available for direct push wells.

Advantages of Direct Push

- Faster installation rate
- Small well diameters allows for rapid purge volume removal
- Sampling may occur immediately after installation
- Individual wells can be sequentially sampled at successive depths for a complete aquifer profile
- No soil cuttings
- More accessible in remote locations because the equipment is smaller and easier to transport
- Facilitates more complete site characterization.

Disadvantages of Direct Push

- Some installations have no filter pack, which can possibly lead to well silting
- Exposed-screen installations can “drag down” contamination
- Some conventional instruments, such as submersible pumps, may not fit in smaller diameter wells,
- Recharge rates may not be sufficient for some pump test volume requirements
- Depth for well installation is less than with a drill rig
- Cobbles in unconsolidated deposits can limit direct push rods

ASTM Standards D6001-05 (2005), D6724-04 (2004), 6725-01 (2002) ASTM D6282-98 (2005) provide detailed instructions on direct-push methods for drilling, and soil and ground-water sampling. A common problem experienced with this method in Alaska is difficult advancement of drive points and casing in some soil conditions, such as cobbles or glacial tills.

Comparison studies between direct push and hollow-stem auger drilled wells in a wide range of formations show little difference in performance. Studies conducted by BP Corporation North America Inc. and the UST Programs of the USEPA Regions 4 and 5 (2002) and Kram et al. (2001) were of short duration, but found that water-level elevations and contaminant concentrations were statistically comparable between the two well types. Bartlett et al. (2004) and BP and USEPA (2002) found that some types of direct push wells yielded slightly lower hydraulic conductivity values than drilled wells, but that proper well development and variables other than well construction were of greater significance. Direct push wells installed with proper filter packs and annular seals may be approved by ADEC for long term monitoring. The lack of an annular seal in exposed-screen installations may result in the introduction of water or contaminants from the ground surface or across water bearing zones. Therefore these types of direct push wells are not approved for long term monitoring, but may be appropriate for collecting grab samples during site characterization as long as the well is properly developed prior to sampling. It is important to note that the resultant data will be restricted in use and site closure may require that samples be collected using drilled wells or direct push wells with filter packs, surface seals, flanges, and annular seals.

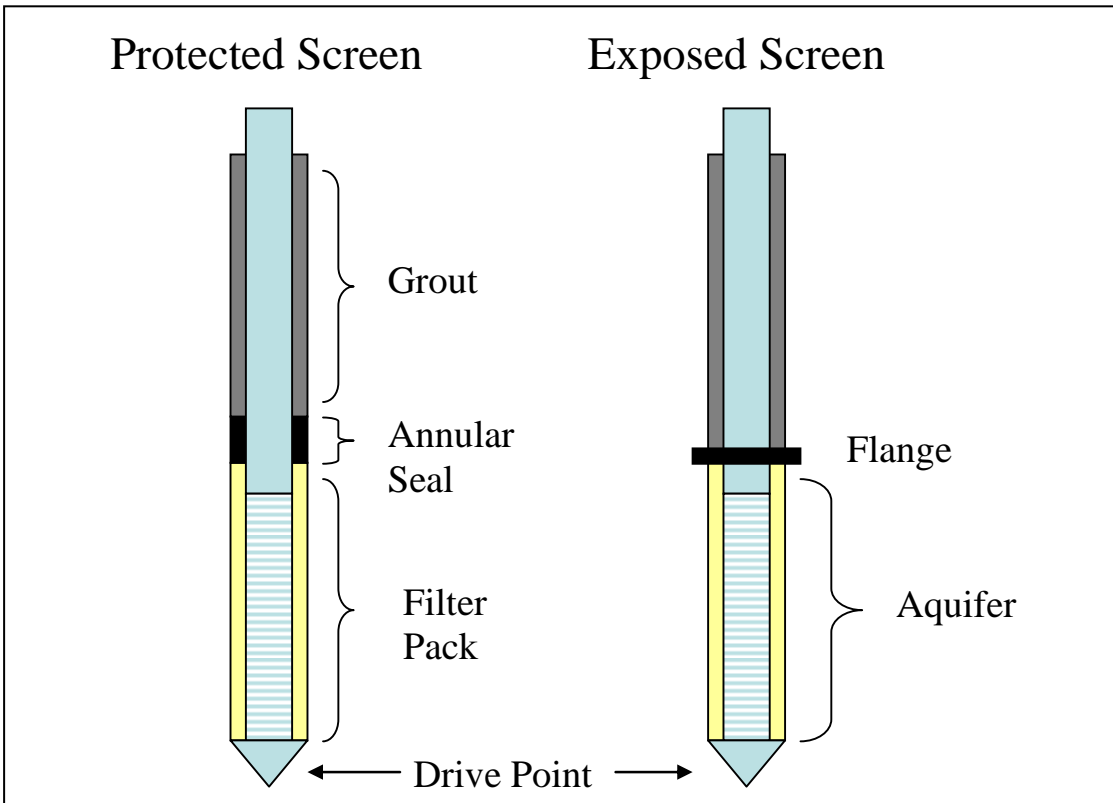


Figure 6: This diagram illustrates two different types of well installations, a "protected" screen direct push installation, and an "exposed" screen direct push installation (Naval Facilities Engineering Command, 2005).

An alternate method for the installation of direct push wells is to excavate a test pit or hand auger to within several feet of the water table, then push a well point the final few feet into the water table. This method creates fewer disturbances in the aquifer allowing for a shorter development time and short term or long term monitoring wells may be installed as detailed in the next section.

Excavation Installed Wells

Key Principals, Specifications, and Precautions

1. Determine the purpose of the well.
2. Evaluate site-specific hydrogeologic information from all available sources, including the physical and chemical properties of the groundwater and any contaminants known or suspected to be present in the groundwater.
3. Develop a conceptual hydrogeologic model of the site.
4. Determine screened interval based on known groundwater levels.
5. Determine the diameter of the well.

6. Take appropriate precautions during excavation/placement to avoid introducing contaminants into the well. Prevent vertical movement of water or contaminants between water-bearing zones.
7. Properly decontaminate all equipment placed into the well by steam cleaning, high-pressure hot water, or similar methods between well installations.
8. Manage water removed from the well in accordance with 18 AAC 75 or 18 AAC 78.
9. Complete an “as built” drawing/schematic for each constructed monitoring well.
10. Survey wells vertically and horizontally with survey loops that close within 0.01’ vertically, and 0.2’ horizontally. The well survey data must be provided to ADEC in a written report. Submit a record of the well design, installation, and the materials used to ADEC.

Discussion

Excavation installed wells are placed into an open excavation or test pit, then backfilled, developed, purged and sampled as traditional wells. The well casing is constructed in its entirety prior to placement into the excavation. Care should be taken to locate the screened interval within the desired sampling interval. Excavation installed wells may need additional development time as the likelihood of soil and sediment being present in the groundwater is greater than with drilled or direct push wells.

Because of this disturbance, excavation installed wells are much more likely to produce non-representative groundwater quality samples for a much longer period of time than wells installed using other techniques. Similar to all techniques for monitoring well installation, the longer the period that has elapsed since the date of installation, the more representative the water quality of the water sample obtained from the MW. However, the disturbance is so great with excavation-installed wells that a significantly longer period may be required to re-establish equilibrium conditions such that water from these wells yields the true reflection of surrounding GW quality.

Short term monitoring wells may or may not have a filter pack, interstitial seal or surface seal, depending on their application. Whereas, long term monitoring wells must have a filter pack, interstitial seal and surface seal, unless otherwise approved by ADEC. This method would involve installing a filter pack as for a drilled well or placing a pre-packed well point inside of a PVC or steel casing that is slotted across the same sampling interval, then completing the well with an additional sand pack, annular, and surface seal. All short term and long term monitoring wells must be decommissioned in accordance with this document.

Well Development and Maintenance

Key Principals, Specifications, and Precautions

1. Develop the well by surging, pumping, and bailing.
2. Monitor water quality parameters.

3. Do not develop the well for at least 24 hours following installation.

Discussion

The primary function of a monitoring well is to provide a representative sample of groundwater as it exists in the formation. The goal of well development is to repair the damage caused during drilling, direct-push emplacement or excavation well installation to the area immediately adjacent to the well, ensuring proper hydraulic connection to the aquifer. Formation changes during well installation are variable, but are usually the compaction of unconsolidated particles surrounding the annulus. In fine-grained soils, this can result in a “mudwall” around the boring annulus, which can impede free flow of the formation water into the well. Development should agitate the adjacent formation and pull fines into the well, where they can be removed along with the development water. Well installations in finer-grained deposits are more difficult as the filter pack will not completely stop fines from entering the well.

Common well development methods are a combination of surging, pumping, air or water injection and bailing. In relatively permeable formations, lower a bailer to the water column and surge by use of a surge block attached to tubing to help breakdown any mud wall and prevent particle bridging. Unidirectional flow into the well can cause formation particles to “bridge” together and form blockages. Stopping and starting the pump can aid in a surge toward the formation, which can help break up bridged particles. It is more effective to alternate between using a surge block and bailing or pumping so that there is multidirectional flow on the filter pack around the well. Continue pumping, bailing, and surging until the turbidity decreases. Ideally, the formation water pulled from the well will now be clear. However, it is important not to overdevelop a well by overly aggressive surging. Occasionally, it may not be possible to clear the water from a well due to high concentrations of naturally occurring suspended solids in the aquifer.

Develop groundwater monitoring wells that can be purged dry by first purging the well and then allow the well to refill with formation water.. If the recovery rate by the formation water is too slow then add up to one well casing volume of potable water to the well. With water in the well, surge the well vigorously for approximately 10 minutes by using either a surge block or bailer. Add more water as necessary. After surging the well, purge it dry again to complete the development process

Alternative development procedures may be used if they will not affect the ability of the well to provide representative samples. Wells installed with an annular seal must not be developed until 24 hours after well installation to allow annular seal materials to set or cure. ADEC recognizes that remote site work may make this impractical. Contact your ADEC project manager for site specific approval if development is to be conducted prior to the 24 waiting period. Sample the monitoring well in accordance with the ADEC Draft Field Sampling Guidance.

ADEC decisions are based on trends over time, not a single sampling event. More than one water sample is required to establish the water quality in any monitoring well, especially a newly installed well. The water quality in a newly installed monitoring well

becomes more reliable over time, as the aquifer and the newly installed well reach a state of chemical equilibrium.

ASTM standard D5521 (1994) provides guidance on the development of monitoring wells, and standard D5978 (2000) provides guidance on maintaining and repairing a monitoring well. Additionally, EPA (1991) provides a detailed discussion on well development.

Monitoring Wells in Frozen Ground

Key Principals, Specifications, and Precautions

1. Minimize effects on the subsurface thermal regime.
2. Maintain wells to ensure sample collection at any time of year.
3. Seal the annular space between the casing and any permafrost to prevent upward seepage.

Discussion

Design and construct monitoring wells and well points to minimize effects on the subsurface thermal regime (permafrost) and to withstand freeze-thaw forces (seasonal frost). Design and construct monitoring wells installed above permafrost (i.e. screened in the seasonally active layer) to obtain a representative groundwater sample during the period of thaw. Additionally, groundwater that rises in the casing up into the permafrost or frozen ground zone may freeze.

Wells installed in a permafrost layer require special attention. Use caution when installing a well through permafrost that may be acting as a confining unit because flowing artesian conditions may occur. In addition, firmly seal the thawed annulus between the pipe and the permafrost to prevent seepage upward from the confined aquifer.

Monitoring Well Decommissioning

Key Principals, Specifications, and Precautions

1. Decommission monitoring wells and well points as soon as practicable, once ADEC has determined that they are no longer needed.
2. The preferred method is to decommission a well by first knocking out the bottom of the screen with a steel drill rod/pipe, allowing the well itself to be used as a tremie pipe.
3. Remove the well casing and screen until the screened interval is above the groundwater interface, allowing the aquifer material to collapse into the borehole. As a general rule, if it is a 10' screen, pull the well out 10', and so on for different screen lengths.
4. Once the casing has been withdrawn to above the groundwater interface, add sealing grout or bentonite chips to the well until the materials are near ground surface. Chips will

require hydration after completion. It is important to add more sealing material as the casing is withdrawn to ensure a steady amount is applied to the borehole. Allowing the materials to completely vacate the well casing during removal may cause the borehole to slough and compromise the seal. Keeping the column close to full will help avoid this and also fill any borehole void space should the casing break while being pulled. *Note: if a high static water level exists in the well, consider using coated bentonite tablets or pouring smaller amounts of bentonite chips to avoid “bridging”.*

5. For wells completed in a confined aquifer, begin placing grout or bentonite chips within the confining stratum to prevent migration through the confining layer.
6. Ensure that sealing grouts, when used, are properly mixed and prepared in accordance with manufacturer recommendations prior to placement.
7. Continue to apply sealing materials as the well is removed to approximately 2 feet below ground surface. Complete by filling the remaining 2' with sand or gravel, and repair asphalt/cement as necessary.
8. Record decommissioning procedures and report to ADEC.

Discussion

The goal in decommissioning monitoring wells and well points for piezometers and transducers is to protect the aquifer. ADEC approval of decommissioning methods must be obtained prior to any monitoring well decommissioning. Decommission wells that are damaged beyond repair, abandoned, or not intended for future use. A well that is no longer maintained and secured is susceptible to damage that can prevent proper future decommissioning, and is a potential conduit for direct surface contamination to the aquifer. Unless ADEC approves an alternative schedule, decommission monitoring wells and well points as soon as practicable, once ADEC has determined that it's no longer needed

Most monitoring wells are constructed of PVC casing and screen, with flush-threaded joints. Well casing or screen should typically never be removed unless sealing grout or bentonite chips are concurrently placed in the vacated borehole during removal. Alternate decommissioning methods are discussed below.

Decommissioning – Well Casing and Screen Remaining In-Place: Permafrost or other unique circumstances may prevent the removal of the well casing and screen assembly at the time of decommissioning. If the original construction of the well is known to have included a competent annular seal of grout or bentonite chips surrounding the well casing, the screen should be filled with sand and the casing should be completely sealed in-place up to the casing cutoff point located near the ground surface.

Re-drilling the Well: Re-drilling should only be used when neither decommissioning method described above can be successfully employed. This can be an effective fallback option in circumstances where the well has been damaged, broken, filled, or plugged with soil or other extraneous media, preventing successful decommissioning using either of

the prior two described methods. The concern with re-drilling a monitoring well borehole is there is no way to ensure that the augers will follow the original borehole to the completed well depth.

Using this method PVC casing and well screen may be destroyed and broken into multiple pieces while re-drilling the borehole. After the auger string has been drilled to the total depth of the well, grout or bentonite chips are placed at the bottom of the auger until a fill column is established within the auger to near the ground surface and the top of the drill string. Then the augers are methodically withdrawn while adding grout or bentonite chips to maintain the fill column within the auger to near the ground surface until the entire auger has been removed. EPA (1991) and ASTM standard D5299 (2005) discuss well decommissioning in more detail.

Alaska Drinking Water regulations (18 AAC 80.015(e)) require that a person who decommissions a monitoring well, a public water supply well, an observation well associated with testing a public water system supply well, or a private well shall use a method that conforms to ANSI/AWWA Standard A100-97, adopted by reference in 18 AAC 80.010 or an alternate method approved by the ADEC; however, the alternate method must be submitted to the ADEC under the signature and seal of a registered professional engineer, prior to ADEC review and approval.

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Definitions

- 1) Active thaw layer - Surface layers of organic matter and mineral soil that thaw each year
- 2) Annular space seal - (a) For wells constructed with filter packs, the material above the top of the filter pack seal up to the surface concrete seal, and between the well casing and the adjacent formation. (b) For wells constructed in bedrock formations and without well screens, the material placed from the bottom of the enlarged drill hole up to the surface concrete seal, and between the well casing and the adjacent formation.
- 3) Aquifer - Geologic formation, group of formations, or part of a formation that is saturated, and is capable of providing a significant quantity of water
- 4) Aquitard - Lithologic unit that impedes groundwater movement and does not yield water freely to wells or springs but that may transmit appreciable water to or from adjacent aquifers.
- 5) Assessment monitoring - An investigative monitoring program that is initiated after the presence of a contaminant in groundwater has been detected to determine the concentration of constituents that have contaminated the groundwater and to quantify the rate and extent of migration of these constituents
- 6) ASTM - American Society for Testing and Materials
- 7) Bailer - Hollow tubular receptacle, fitted with a check valve at the bottom, used to facilitate withdrawal of fluid from a well or borehole
- 8) Bentonite cement grout - Mixture of five pounds of sodium based montmorillonite clay with 94 pounds of Portland cement and fix to six gallons of water
- 9) Bentonite chips-Impure clay consisting mostly of montmorillonite and coming in two basic size range - 1/4 to 3/8-inch, and 1/2- to 3/4-inch.
- 10) Bentonite slurry - Mixture of sodium based montmorillonite clay and water that has a minimum mud weight of 10 pounds per gallon
- 11) Borehole - Circular hole deeper than it is wide constructed in earth material for the purpose of either installing a well or obtaining geologic or groundwater related data
- 12) Borehole log - Record of geologic units penetrated, drilling progress, depth, water level, sample recovery, volumes and types of materials used, or other significant observations regarding the drilling of an exploratory borehole or well
- 13) Casing - Pipe finished in sections with either threaded connections or beveled edges to be field welded, which is installed temporarily or permanently to counteract caving to advance the borehole, and/or to isolate the zones being monitored

- 14) Casing (Protective) - Section of large diameter pipe placed over the upper end of a smaller diameter monitoring well riser or casing to provide structural protection to the well and restrict access to the well.
- 15) Casing (Surface) - Pipe used to stabilize a borehole near the surface during and following the drilling of the borehole
- 16) Concrete grout - Slurry mixture of 94 pounds of cement, equal volumes of dry sand and gravel, and five to six gallons of water. The ratio of sand and gravel should not exceed three parts to one.
- 17) Detection monitoring – Program of monitoring for the express purpose of determining whether or not there has been a contaminant release to groundwater.
- 18) Drillhole – Equivalent to borehole
- 19) Filter pack - Clean silica sand or sand and gravel mixture of rounded grains with a selected grain size and gradation that is installed in the annular space between the borehole wall and the well screen, extending an appropriate distance above the screen for the purpose of retaining and stabilizing the particles from the adjacent strata
- 20) Flush-joint or flush-coupled - Casing or riser with ends threaded such that a consistent inside and outside diameter is maintained across the threaded joints or couplings
- 21) Grout – Low permeability material placed in the annulus between the well casing or riser pipe and the borehole wall (i.e., in a single cased monitoring well), or between the riser and casing i.e., in a multi-cased monitoring well), to maintain the alignment of the casing and riser and to prevent movement of groundwater or surface water within the annular space
- 22) Inside diameter - Distance, perpendicular to the long axis of the casing
- 23) Long term monitoring well- A monitoring well that is comprised of a filter pack, annular seal and surface seal. Long term monitoring wells are applicable when two or more sampling events will be conducted.
- 24) Neat cement grout - Slurry mixture of 94 pounds of Portland cement mixed with 5 to 6 gallons of water.
- 25) Piezometer - Well installed for the specific purpose of determining the elevation of the potentiometric surface
- 26) Purge - An action that removes water from a well, commonly accomplished using a pump or bailer
- 27) Riser pipe - Pipe extending from the well screen to or above the ground surface

- 28) Rotary drilling method - Drilling method whereby the drillhole is constructed to the depth of casing setting and the well casing is set to the bottom of the drillhole rather than driven
- 29) Short term monitoring well- A monitoring well installed for the purpose of one monitoring event, Short term monitoring wells may or may not have a filter pack, annular seal or surface seal, depending on their application.
- 30) Sodium based bentonite - Clay consisting of at least 85 percent sodium montmorillonite
- 31) Static water level - The elevation of the top of a column of water in a monitoring well or piezometer that is not influenced by pumping or conditions related to well installation, hydrologic testing, or nearby pumpage
- 32) Surge - An action causing water to move rapidly in and out of the well screen thereby removing fine material from the surrounding aquifer
- 33) Top of bedrock - The top of firm rock, as indicated by at least 70 percent of the drill cuttings being either (1) angular rock fragments, as in the case of crystalline rock or (2) rock fragments composed of individual grains or rock particles that are cemented together to form an aggregate
- 34) Top of filter pack seal - Sealing material at least two feet in length placed in the annular space above the filter pack and below the annular space seal
- 35) Tremie pipe - Metal pipe or steel wire-braided, rubber-covered hose used to convey well construction materials down a drillhole
- 36) Unconsolidated material - Material found above firm bedrock, composed of single sediment particles, individual grains or rock fragments
- 37) Water table - The surface of unconfined groundwater where the pressure is equal to atmospheric pressure
- 38) Water table observation well - Any groundwater monitoring well installed for the specific purpose of determining either the elevation of the water table, or the physical, chemical, biological, or radiological properties of groundwater at the water table or both
- 39) Well depth - Distance from the land surface to the bottom of the well screen or drill hole
- 40) Well screen - Filtering device used to retain the primary or natural filter pack, usually a cylindrical pipe with openings of a uniform width, orientation, and spacing
- 41) Well volume - Volume of water standing in the well casing

- 42) Zone of saturation - A hydrologic zone in which all the interstices between particles of geologic material or all of the joints, fractures, or solution channels in a consolidated rock unit are filled with water at pressure greater than that of the atmosphere

APPENDIX E

Department of the Army, Regulatory Division
Permit No. POA-1993-866-M2, Illuliuk Bay.

This permit covers filling at the Unalaska Phase II Landfill Area.



REPLY TO
ATTENTION OF:

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, ALASKA
REGULATORY DIVISION
P.O. BOX 6898, CEPOA-RD
JBER, ALASKA 99506-0898

FILE COPY

March 13, 2012

Regulatory Division
POA-1993-866-M2, Iliuliuk Bay

City of Unalaska
Department of Public Works
Attention: Mr. Tyler Zimmerman
Post Office Box 610
Unalaska, Alaska 99685

Dear Mr. Zimmerman:

Enclosed is the signed Department of the Army permit, file number POA-1993-866-M2, Iliuliuk Bay, which authorizes a time extension to complete Phase II and Phase III of the Unalaska landfill facility. The project site is located within section 2, T. 73 S., R. 118 W., Seward Meridian, latitude 53.8848° N., longitude 166.5081° W., in Unalaska, Alaska. Also enclosed is a Notice of Authorization which should be posted in a prominent location near the authorized work.

If changes to the plans or location of the work are necessary for any reason, plans must be submitted to us immediately. Federal law requires approval of any changes before construction begins.

Nothing in this letter excuses you from compliance with other Federal, State, or local statutes, ordinances, or regulations.

Thank you for your cooperation with the Corps of Engineer's Regulatory Program. If you have any questions, please contact me via email at Jack.J.Hewitt@usace.army.mil, or in writing at the letterhead address, by phone at (907) 753-2708.

Sincerely,


Jack Hewitt
Project Manager

Enclosures

DEPARTMENT OF THE ARMY PERMIT

Permittee: City of Unalaska

Permit No.: POA-1993-866-M2, Iliuliuk Bay

Issuing Office: U.S. Army Engineer District, Alaska

NOTE: The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate district or division office of the Corps of Engineers having jurisdiction over the permitted activity or the appropriate official of that office acting under the authority of the commanding officer.

You are authorized to perform work in accordance with the terms and conditions specified below.

Project Description: Complete Phase II of the authorized landfill expansion project. Work not previously permitted includes filling an additional 0.2 acre of wetlands located directly north of the existing baler building. All work would be performed in accordance with the enclosed plan, 4 sheets, dated 11/31/2011.

Project Location: The project is located within section 2, T. 73 S., R. 118 W., Seward Meridian, latitude 53.8848° N., longitude 166.5081° W., in Unalaska, Alaska.

General Permit Conditions:

1. The time limit for completing the work authorized ends on **February 28, 2017**. If you find that you need more time to complete the authorized activity, submit your request for a time extension to this office for consideration at least one month before the above date is reached.
2. You must maintain the activity authorized by this permit in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith transfer to a third party in compliance with General Condition 4 below. Should you wish to cease to maintain the authorized activity or should you desire to abandon it without a good faith transfer, you must obtain a modification of this permit from this office, which may require restoration of the area.
3. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and State coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.
4. If you sell the property associated with this permit, you must obtain the signature of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.
5. If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit. For your convenience, a copy of the certification is attached if it contains such conditions.
6. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

Special Permit Conditions 1-4, and 6, were carried on the original authorization issued in 1994 and remain in full force and effect. Special condition 5 on the original permit is no longer in effect.

1. That siltation curtains must be constructed on the ocean side of the relocated Summer Bay road fill pad, (before the discharge of any fill material into these sites), to prevent fill erosion and siltation of the adjacent marine waters.
2. That the fill pad slopes on the ocean side of the relocated Summer Bay Road shall be stabilized by fertilizing and planting a mixture of grasses to insure a minimum of 30% cover established by the end of the first growing season. Native species should be used where appropriate.
3. There shall be no equipment encroachments, stockpiling, or double-handling of fill or construction materials, on adjacent wetland outside of the project boundary.
4. That the permittee shall properly construct and maintain the fills to prevent erosion. Increased water turbidity and sediment in drainages ditches, and adjacent wetlands shall be evidence of insufficient stabilization.
6. That material changes in, or failure to implement and enforce the recommendations contained in the May 4, 1994, U.S. Department of Agriculture letter from Mr. Paul M. O'Neil, to Mr. Roe Sturgulewski, Public Works Director, City of Unalaska, and the Alaska Department of Environmental Conservation Solid Waste Disposal Facility Permit No. 9321-BA008, shall be grounds for modifying, suspending, or revoking this permit.

Special Information: Any condition incorporated by reference into this permit by General Condition 5, remains a condition of this permit unless expressly modified or deleted, in writing, by the District Engineer or his authorized representative.

Further Information:

1. Congressional Authorities: You have been authorized to undertake the activity described above pursuant to:
 - () Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403).
 - (X) Section 404 of the Clean Water Act (33 U.S.C. 1344).
 - () Section 103 of the Marine Protection, Research, and Sanctuaries Act of 1972 (33 U.S.C. 1413).
2. Limits of this authorization.
 - a. This permit does not obviate the need to obtain other Federal, State, or local authorization required by law.
 - b. This permit does not grant any property rights or exclusive privileges.
 - c. This permit does not authorize any injury to the property or rights of others.
 - d. This permit does not authorize interference with any existing or proposed Federal project.
3. Limits of Federal Liability. In issuing this permit, the Federal Government does not assume any liability for the following:
 - a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.
 - b. Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United States in the public interest.
 - c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.
 - d. Design or construction deficiencies associated with the permitted work.

- e. Damage claims associated with any future modification, suspension, or revocation of this permit.
4. Reliance on Applicant's Data: The determination of this office that issuance of this permit is not contrary to the public interest was made in reliance on the information you provided.
5. Reevaluation of Permit Decision. This office may reevaluate its decision on this permit at any time the circumstances warrant. Circumstances that could require a reevaluation include, but are not limited to, the following:
- a. You fail to comply with the terms and conditions of this permit.
 - b. The information provided by you in support of your permit application proves to have been false, incomplete, or inaccurate (See 4 above).
 - c. Significant new information surfaces which this office did not consider in reaching the original public interest decision.

Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 CFR 325.7 or enforcement procedures such as those contained in 33 CFR 326.4 and 326.5. The referenced enforcement procedures provide for the issuance of an administrative order requiring you to comply with the terms and conditions of your permit and for the initiation of legal action where appropriate. You will be required to pay for any corrective measures ordered by this office, and if you fail to comply with such directive, this office may in certain situations (such as those specified in 33 CFR 209.170) accomplish the corrective measures by contract or otherwise and bill you for the cost.

6. Extensions. General Condition 1 establishes a time limit for the completion of the activity authorized by this permit. Unless there are circumstances requiring either a prompt completion of the authorized activity or a reevaluation of the public interest decision, the Corps will normally give favorable consideration to a request for an extension of this time limit.

Your signature below, as permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.

John Zimmerman City Engineer
 (PERMITTEE) AND TITLE

3/5/12
 (DATE)

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

 FOR (DISTRICT COMMANDER)
 Colonel Reinhard W. Koenig
 Jack Hewitt, Project Manager
 South Branch, Regulatory Division

 (DATE)

When the structures or work authorized by this permit are still in existence at the time the property is transferred the terms and conditions of this permit will continue to be binding on the new owner(s) of the property. To validate the transfer of this permit and the associated liabilities associated with compliance with its terms and conditions have the transferee sign and date below.

 (TRANSFEREE)

 (DATE)

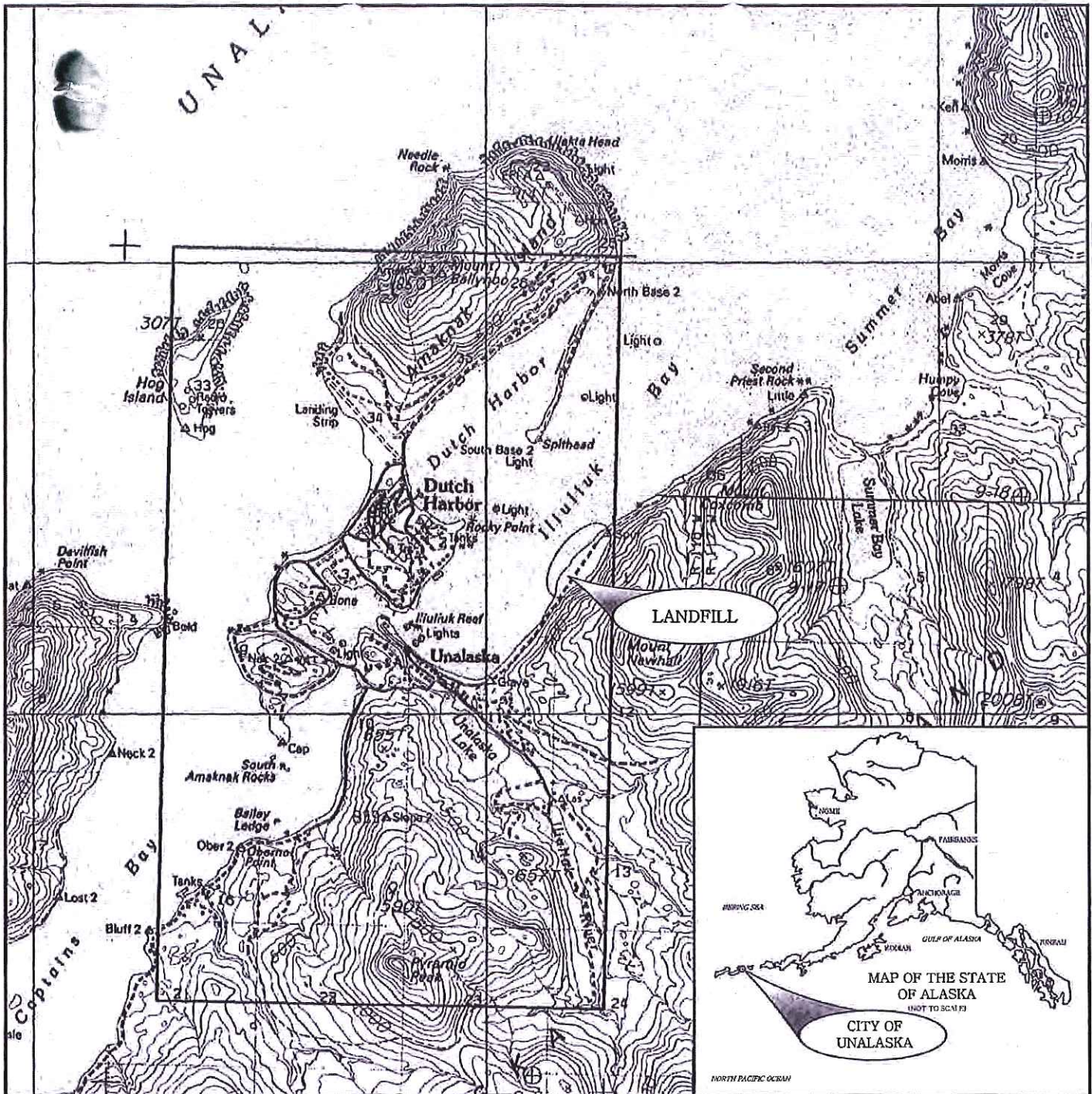


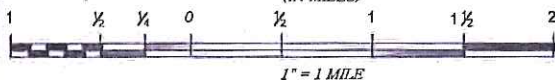
FIGURE 1

VICINITY MAP

UNALASKA LANDFILL EXPANSION
PHASE I AND PHASE II

PAGE 1 of 4

GRAPHIC SCALE
(IN MILES)



USACE REFERENCE:
POA-1993-866-M
ILIULIUK BAY 56

PURPOSE:
EXPANSION OF SOLID WASTE LANDFILL

LOCATION:
UNALASKA, ALASKA

APPLICANT:
CITY OF UNALASKA

ADJACENT PROPERTY OWNERS:
OUNALASHKA CORPORATION

SOURCE:
USGS QUAD MAP UNALASKA
(C-2), ALASKA

VERTICAL DATUM:
NGVD 29 (NOAA TIDAL)
MHW = 0.00'

HORIZONTAL DATUM:
NAD83
53.8848° NORTH
166.5081° WEST
ADNR PLAT 305-1994-25
SECTION 1, T73S, R118W, S.M.

DATE DRAWN:
11/31/2011

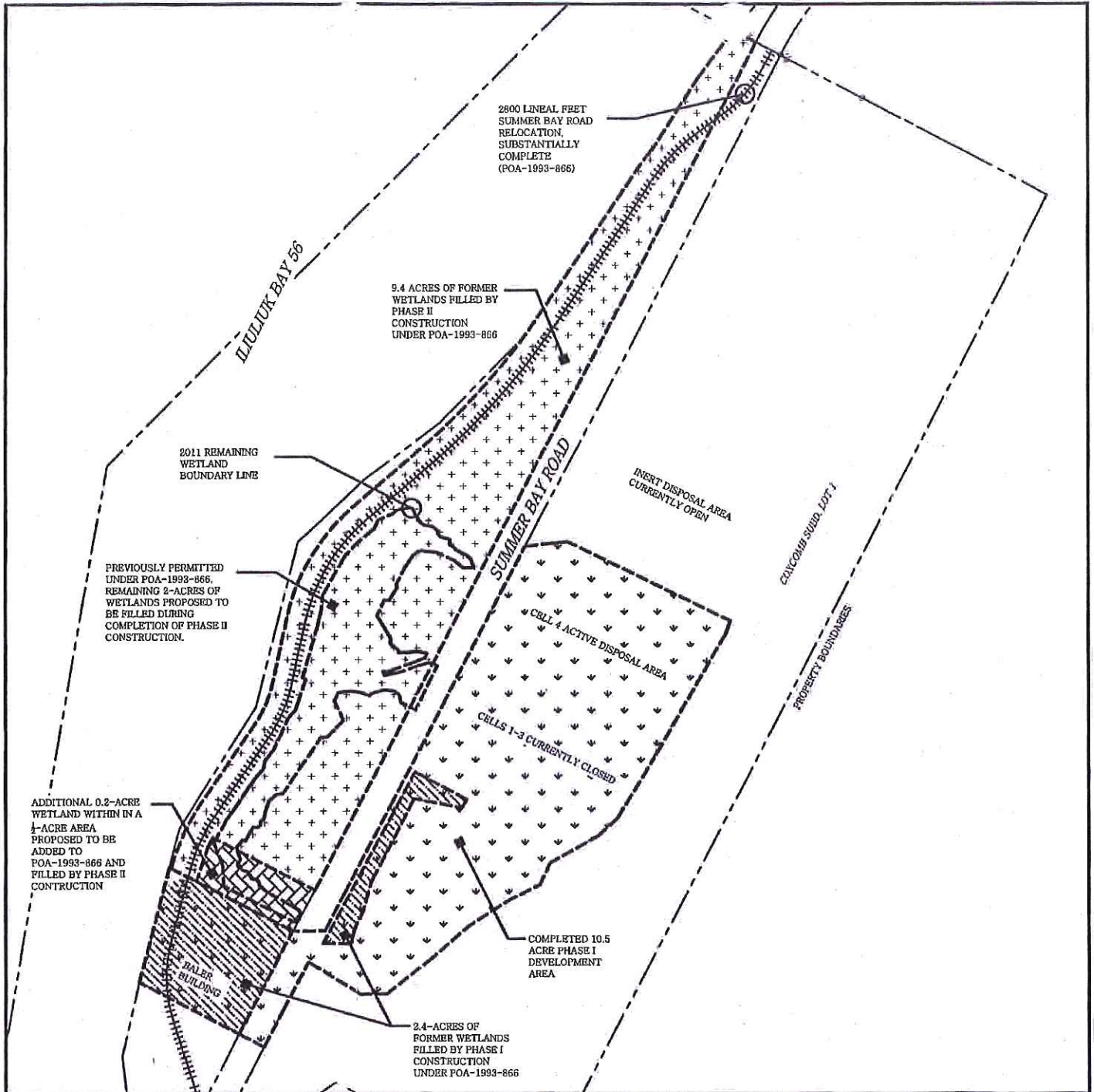


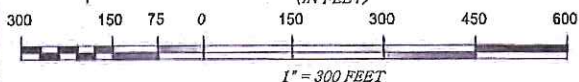
FIGURE 2

AS-BUILT SITE PLAN

UNALASKA LANDFILL EXPANSION
PHASE I AND PHASE II

PAGE 2 of 4

GRAPHIC SCALE
(IN FEET)



USACE REFERENCE:

POA-1993-866-M
ILIULIUK BAY 56

PURPOSE:

EXPANSION OF SOLID WASTE LANDFILL

LOCATION:

UNALASKA, ALASKA

APPLICANT:

CITY OF UNALASKA

ADJACENT PROPERTY OWNERS:

OUNALASHKA CORPORATION

SOURCE:

AERIAL IMAGERY 7/24/2010
BY KODIAK MAPPING.

VERTICAL DATUM:

NGVD 29 MLLW

HORIZONTAL DATUM:

NAD83
53.8848° NORTH
166.5081° WEST
ADNR PLAT 305-1994-25
SECTION 1, T73S, R118W, S.M.

DATE DRAWN:

11/31/2011

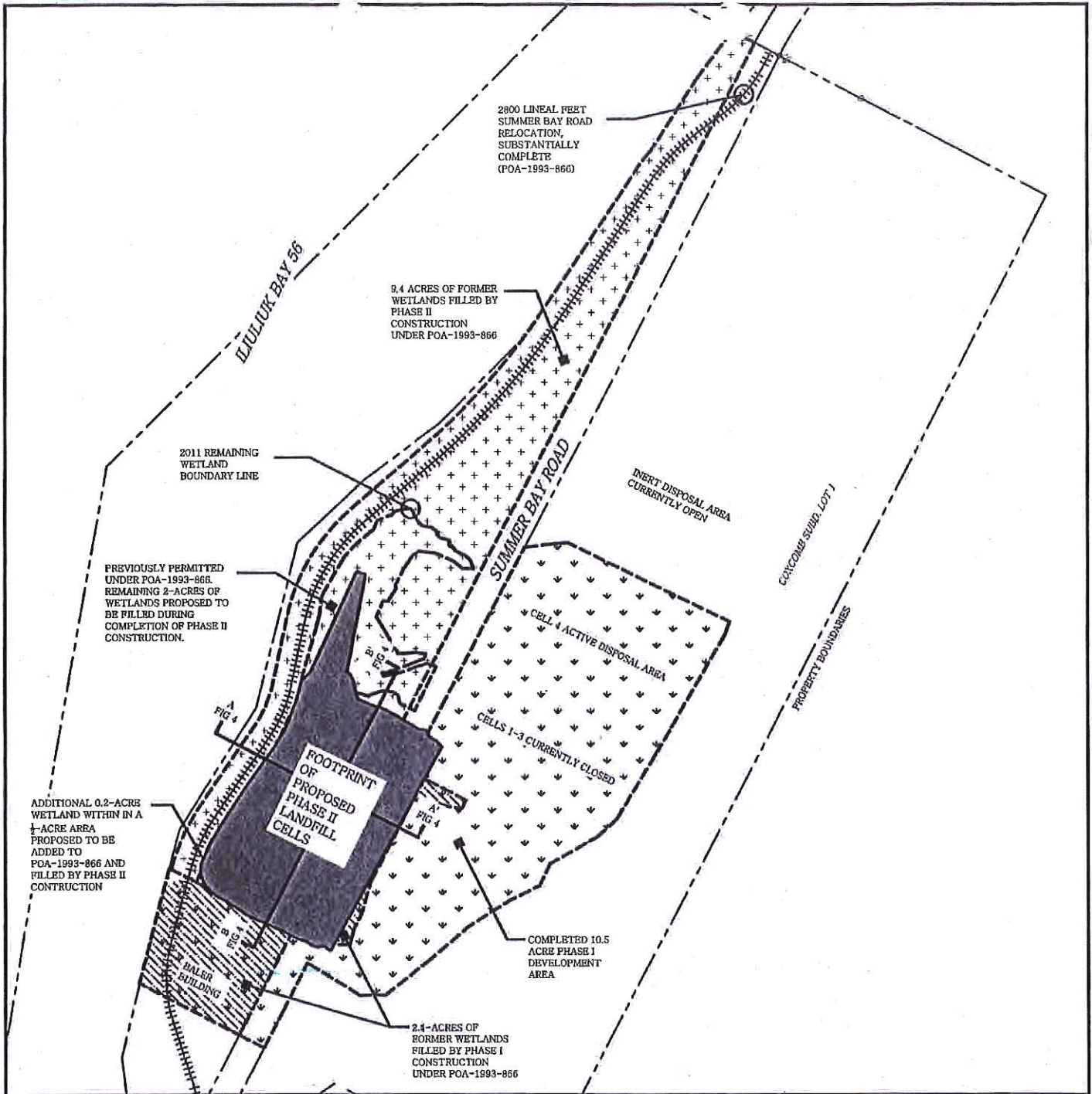


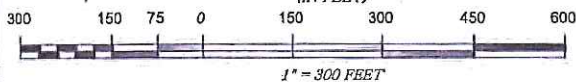
FIGURE 3

PHASE II EXPANSION

UNALASKA LANDFILL EXPANSION
PHASE I AND PHASE II

PAGE 3 of 4

GRAPHIC SCALE
(IN FEET)



USAGE REFERENCE:

POA-1993-866-M
ILIULIUK BAY 56

PURPOSE:

EXPANSION OF SOLID WASTE LANDFILL

LOCATION:

UNALASKA, ALASKA

APPLICANT:

CITY OF UNALASKA

ADJACENT PROPERTY OWNERS:

OUNALASHKA CORPORATION

SOURCE:

CITY OF UNALASKA

VERTICAL DATUM:

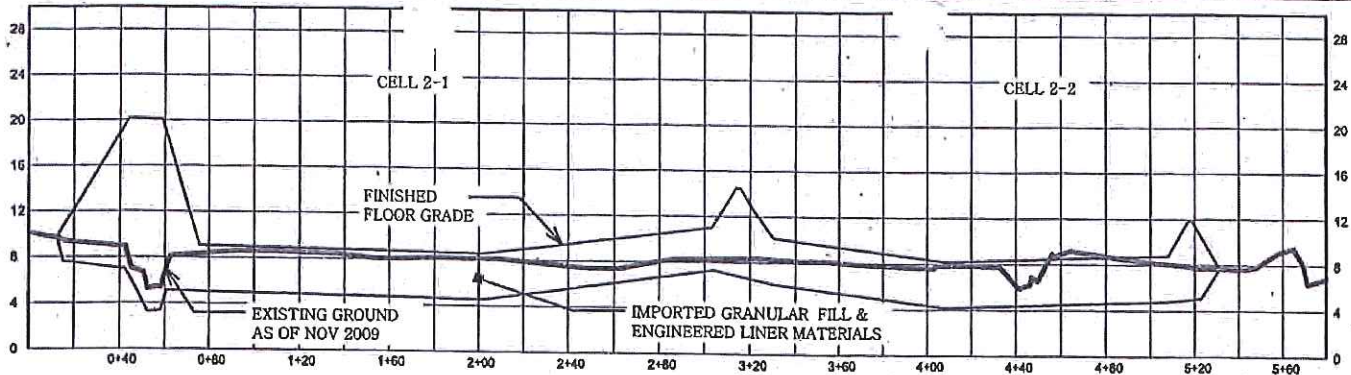
NGVD 29 MLLW

HORIZONTAL DATUM:

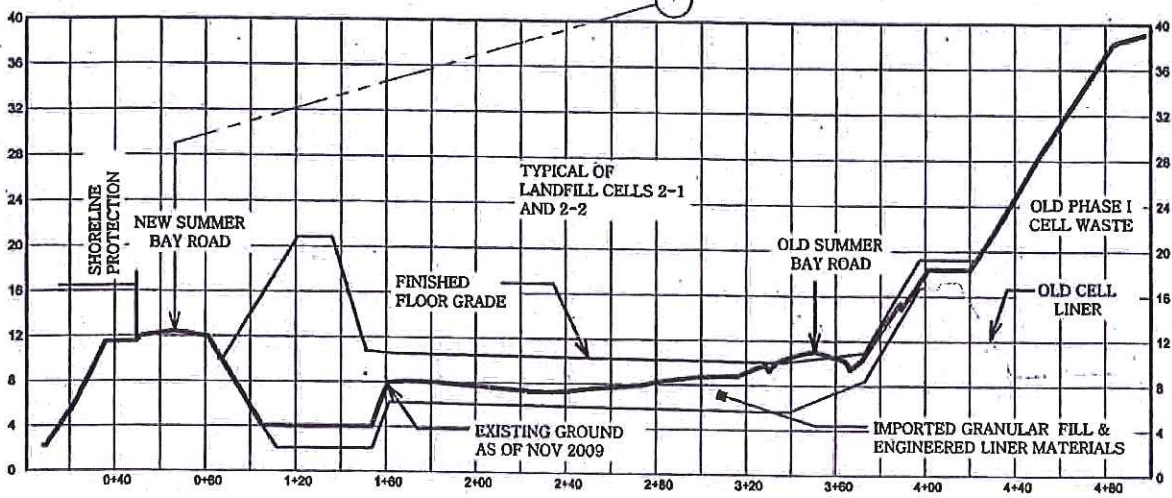
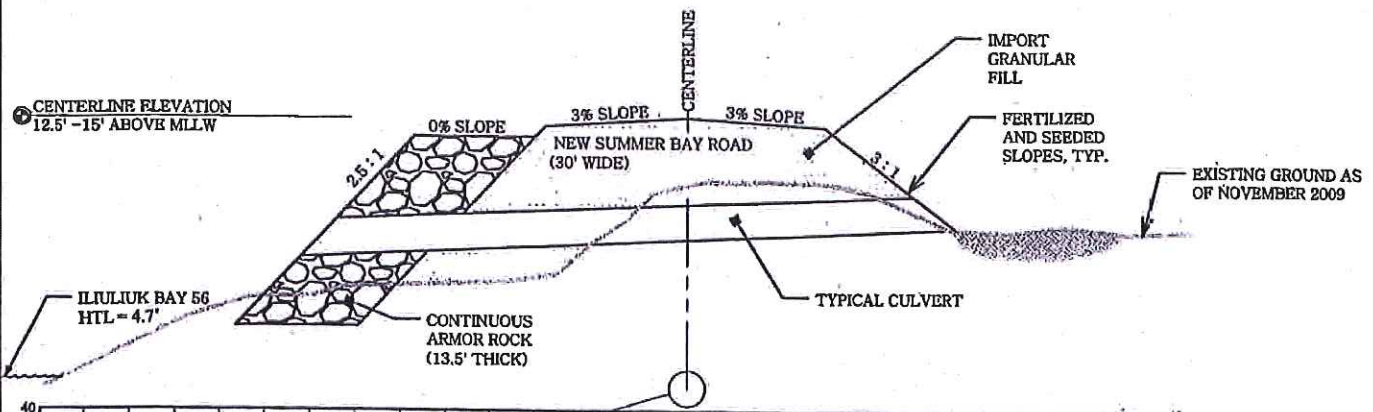
NAD83
53.8848° NORTH
166.5081° WEST
ADNR PLAT 305-1994-25
SECTION 1, T73S, R118W, S.M.

DATE DRAWN:

11/31/2011



B - B' SECTION VIEW OF PHASE II LANDFILL CELLS (FROM FIGURE 3)



A - A' SECTION VIEW OF PHASE II LANDFILL CELLS (FROM FIGURE 3)

FIGURE 4

DETAILS

UNALASKA LANDFILL EXPANSION
PHASE I AND PHASE II

PAGE 4 of 4

USACE REFERENCE:
POA-1993-866-M2
ILIULIUK BAY 56

PURPOSE:
EXPANSION OF SOLID WASTE LANDFILL

LOCATION:
UNALASKA, ALASKA

APPLICANT:
CITY OF UNALASKA

ADJACENT PROPERTY OWNERS:
OUNALASHKA CORPORATION

SOURCE:
CITY OF UNALASKA

VERTICAL DATUM:
NGVD 29 (NOAA TIDAL)
MLLW = 0.00'
MHW = 3.73'

HORIZONTAL DATUM:
NAD83
53.8848° NORTH
166.5081° WEST
ADNR PLAT 305-1994-25
SECTION 1, T73S, R118W, S.M.

DATE DRAWN:
11/31/2011



This notice of authorization must be
conspicuously displayed at the site of work.

United States Army Corps of Engineers
ILLUINOIS BAY

A permit to: TO COMPLETE PHASE II AND PHASE III OF THE UNALASKA LANDFILL
FACILITY.

located within: SECTION 2, T. 73 S., R. 118 W., SEWARD MERIDIAN,
LATITUDE 53.8848° N., LONGITUDE 166.5081° W., IN UNALASKA, ALASKA.

has been issued to: THE CITY OF UNALASKA

on: MARCH 13, 2012 and expires on: FEBRUARY 28, 2017

Address of Permittee: POST OFFICE BOX 610, UNALASKA, ALASKA 99685

Permit Number:

POA-1983-866-M2

FOR: *Jack Hewitt*
District Commander
Jack Hewitt
Project Manager
Regulatory Division
(Proponent: CECW-O)

APPENDIX F

Overview, goals, necessary reporting forms, and requirements for compliance with the DBE and EEO Programs

- DBE Program Overview
- EEO and DBE Acknowledgements, Goals, and Forms for Compliance Requirements

**STATE OF ALASKA
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
ALASKA CLEAN WATER FUND & ALASKA DRINKING WATER FUND**

**DISADVANTAGE BUSINESS ENTERPRISES
OVERVIEW**

The loan recipient, consultant and contractor of an Alaska Clean Water or Drinking Water Fund revolving loan project are required to comply with EPA regulations (40 CFR Part 33) concerning the use of disadvantage owned businesses enterprises (DBE). Also required is compliance with EEO/Affirmative Action Regulations of the Department of Labor (see attached Statement of Acknowledgement). These regulations help ensure that economic opportunities are available to all people of this country.

The expenditure of Federal funds must reflect equal opportunity, anti-discrimination provisions of the 1964 Civil Rights Act, affirmative action and DBE or more specifically small, minority and women-owned businesses utilization under EPA's DBE program. Utilization may be through prime contracting, subcontracting, joint-venture, procurement of supplies, material or equipment, or other business participation utilized in completing a project. For all situations, contractors must take necessary and reasonable steps to ensure DBE's have the maximum opportunity to compete for and/or perform contracts. Contractors shall not discriminate on the basis of race, color, national origin, or sex in the award and performance of projects where assistance is provided from an ADEC revolving loan fund program.

NOTE: On March 26, 2008, the Environmental Protection Agency (EPA) Office of Small Business Programs (OSBP) published its final rule, "Participation by Disadvantaged Business Enterprises in Procurement under Environmental Protection Agency Financial Assistance Agreements (DBE Rule) in the Federal Register (40 CFR part 30-40). The final rule took effect on May 25, 2008. The EPA DBE Program encompasses many of the components of the former MBE/WBE Program and also includes changes.

Some changes are:

- Creation of the Disadvantaged Business Enterprise (DBE) Program (formerly the Minority Business Enterprise/Women's Business Enterprise (MBE/WBE) Program).
- Recipients receiving a total of \$250K or less in financial assistance in a given fiscal year are exempt from this requirement.
- The "Six Affirmative Steps" and "Six Positive Efforts" were combined into the "Six Good Faith Efforts."
- A recipient must require its prime contractor to pay its subcontractor for satisfactory performance no more than 30 days from the prime contractor's receipt of payment from the recipient.
- The loan recipient must be notified in writing by its prime contractor prior to any termination of a DBE subcontractor.

- If a DBE subcontractor fails to complete work under the subcontract for any reason, the prime contractor must use the Six Good Faith Efforts in selecting a replacement subcontractor.
- The prime contractor must employ the Six Good Faith Efforts even if the prime has achieved its Fair Share Objectives.
- Recipients who reported quarterly under the old MBE/WBE program will now report semi-annually.
- MBE's and WBE's can no longer self-certify. They 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. (MBEs and WBEs must be certified in order to be counted toward a recipient's MBE/WBE accomplishments.) The new requirements affect all financial assistance agreements entered into from the effective date of the rule (May 25, 2008). The new DBE rule won't affect those financial assistance agreements entered into before May 25, 2008; those will still operate under the old MBE/WBE program requirements.

SUMMARY OF GOALS

Stated simply, in meeting DBE goals under this program, the prime contractor must either 1) achieve the goal of contracting to Minority or Women-Owned Enterprises (MBE/WBE), or 2) follow the proper procedures in thoroughly documenting good faith efforts to achieve MBE/WBE goal participation. A prime contractor who is an MBE/WBE firm can also be counted towards the goal. (see attached current participation goals for the Department)

REQUIREMENTS

A. Definitions

- Disadvantaged Business Enterprise – Per EPA requirements for projects funded under the Alaska Drinking Water Fund and Alaska Clean Water Fund loan programs, Disadvantage Business Enterprises only include entities owned and/or controlled by socially and economically disadvantaged individuals (as described in 42 USC 7601 and 42 USC 4370d) – which includes Women's Business Enterprises (WBE) and Minority Business Enterprises (MBE). (for more information go to: <http://www.epa.gov/osbp/grants.htm>)
- Minority Business Enterprise or Women Owned Business Enterprise – means a small 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.
- Socially Disadvantaged Individual – means a person 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(a) of the federal Small Business Act.
- Economically Disadvantaged Individual – those socially disadvantaged individuals whose ability to compete in the free enterprise system has been impaired due to diminished capital or credit opportunities, as compared to others in the same business area who are not socially disadvantaged.

B. Implementation for DBE Procurement

As part of ADEC’s capitalization grants for both the ADWF and ACWF loan programs, the programs have an overall Fair Share (or utilization goal) objective of 3.89% for MBE entities and 2.02% for WBE entities for construction only (effective July 1, 2013 – June 30, 2016). The loan recipient, engineering firm responsible for construction phase services, and prime contractor are required to adopt this same fair objective. The fair share objective is not a quota, EPA cannot penalize ADEC, the loan recipient, engineering firm, of the prime contractor for not meeting MBE or WBE participation objectives.

The prime contractor and consulting engineer responsible for construction phase services are required to make the good faith efforts and apply necessary administrative requirements. If the good faith efforts are not made when subcontracts are considered for the prime construction contract or for engineering construction phase services, the ability of ADEC to fund the project, or portion thereof, may be jeopardized.

C. How to Count DBE (MBE/WBE) Goals

The proposed MBE/WBE firms to be used must be declared by the Bidder before contract award. The MBE/WBE may act as a prime contractor, subcontractor, joint venture partner, or supplier. To be counted toward a goal, the MBE/WBE must perform a commercially useful function. To calculate the minimum dollar value for MBE/WBE participation, multiply the total estimated contract price (including additives or alternates, if any) by the goal percentage.

D. How to Obtain DBE (MBE/WBE) Participation

Prior to the scheduled pre-bid conference, solicit MBE/WBE participation to meet the goal. By contract award, the Bidder must either meet the goal or have made good faith efforts to do so. Good faith efforts include, but are not limited to the following:

1. Including qualified small, minority and women's business enterprises on solicitation lists.
2. Assuring that small, minority and women's businesses are solicited. If the MBE/WBE is only certified as a 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 goal objectives.
3. Dividing 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. Using the services and assistance of the Small Business Administration and the Minority Business Development Agency of the U.S. Department of Commerce, as appropriate.
6. If the prime contractor or proposer awards subcontracts/procurements, require the subcontractor to take the affirmative steps 1 through 5 above.

E. How to Credit DBE (MBE/WBE) Participation

If the Bidder's firm is a qualified Minority or Women-Owned Business Enterprise, credit will be given for the portion of the contract for which the Bidder performs a commercially useful function, and for that portion that is subcontracted to other MBE/WBE firms. For example, a MBE/WBE prime contractor proposes to perform 60% of a project quoted at \$500,000, and subcontracts 20% to a majority firm and the remaining 20% to another MBE/WBE. This means the credited MBE/WBE participation will be 80% for the project (60% + 20%) or \$400,000.

F. The DBE (MBE/WBE) Reporting Package

To meet the MBE/WBE reporting requirements of the program, the following forms need to be submitted during the course of bidding, contract award, and administration of this project:

1. COMPLIANCE STATEMENT - acknowledges the MBE/WBE requirement by the bidder. It must be provided with the bid.
2. REPORT OF PARTICIPATION – documents the level of anticipated MBE/WBE participation. It is submitted after bid opening, but before contract award.
3. CONTACT DOCUMENTATION – documents the efforts taken to attain the MBE/WBE goals and it, or other documentation should be submitted with the Report of Participation if the bidder did not meet the established goal.
4. GOOD FAITH EFFORTS – Forms 6100-2, -3 and -4 that identify subcontractor participation, performance and utilization, respectively.

Form 6100-2: This form gives a DBE subcontractor the opportunity to describe the work the DBE subcontractor received from the prime contractor, how much the DBE subcontractor was paid, and any other concerns the DBE subcontractor might have.

This form must be provided to the DBE subcontractor. If the form is submitted by the DBE subcontractor it must be maintained in the file with the prime's contract.

Form 6100-3: This form captures an intended subcontractor's description of work to be performed for the prime contractor and the price of the work submitted to the prime.

This form must be completed by every DBE subcontractor and submitted as part of the bid or proposal package. It must be maintained in the file with the prime's contract.

Form 6100-4: This form captures the prime's intended use of an identified DBE subcontractor, and the dollar amount of the subcontract.

This form must be completed by the prime contractor and submitted as part of the bid or proposal package. It must be maintained in the file with the prime's contract.

5. CONTRACT & PROCUREMENT SEMI-ANNUAL REPORT – documents the actual MBE/WBE contracts executed by the Prime Contractor and submitted to the City. In the first week of April (reporting period, Oct – Mar) and October (reporting period, Apr – Sep), the City will submit a listing of the executed contracts (for the previous reporting) to the Alaska Department of Environmental Conservation through use of form 5700-52A. (form available at: http://www.epa.gov/osbp/pdfs/5700_52a.pdf)

G. Create and Maintain a Bidders List

Any entity that receives an ACWF or ADWF SRF loan is required to create and maintain a bidders list if the loan recipient is subject to, or chooses to follow, competitive bidding requirements. **The list must include all firms that bid or quote on prime contracts, or bid or quote subcontracts, including both MBE/WBEs and non-MBE/WBEs** and must be maintained until the end of the project.

H. DBE Anti-Discrimination Contract Clause

Under 40 CFR part 33, Appendix A, the following statement must be included in **every contract** issued by an ACWF/ADWF borrower to a prime contractor. The statement cannot be changed, modified, or altered in any way.

"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."

**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 Standard Report Form 100 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 the Standard Report Form 100 this year.

NO (go to PART B) YES (go to PART C)

PART B. The company named below (Part C) has submitted the Standard Report Form 100 this year, or intends to at this time.

NO YES

NOTE: Bidders and proposed Subcontractors who file Standard Report Form 100 may also be required to file Form CC-257 Monthly Employment Utilization Report if the project has significant financial impact on a community, or the bidder/subcontractor has signed an agreement to do so. At a minimum, the bidder/subcontractor is required to maintain records which reflect the reporting requirements of CC-257. Standard Report Form 100 and instructions may be obtained by writing to:

EEO-1 Joint Reporting Committee
P.O. Box 19100
Washington, DC 20036-9100
Telephone (866) 286-6440
Email: el.techassistance@eoc.gov

PART C.

Signature of Authorized Representative of Company

Date

Name of Company

(_____)_____
Telephone No.

Address of Company

Zip Code

Project Name

Contract Number

- Joint Reporting Committee
- Equal Employment Opportunity Commission
 - Office of Federal Contract Compliance Programs (Labor)

EQUAL EMPLOYMENT OPPORTUNITY

EMPLOYER INFORMATION REPORT EEO-1

Standard Form 100
REV. 01/2006

O.M.B. No. 3045-0007
EXPIRES 01/2009
100-214

Section A—TYPE OF REPORT

Refer to instructions for number and types of reports to be filed.

1. Indicate by marking in the appropriate box the type of reporting unit for which this copy of the form is submitted (MARK ONLY ONE BOX).

(1) Single-establishment Employer Report

Multi-establishment Employer:

(2) Consolidated Report (Required)

(3) Headquarters Unit Report (Required)

(4) Individual Establishment Report (submit one for each establishment with 50 or more employees)

(5) Special Report

2. Total number of reports being filed by this Company (Answer on Consolidated Report only) _____

Section B—COMPANY IDENTIFICATION (To be answered by all employers)

1. Parent Company

OFFICE
USE
ONLY

a. Name of parent company (owns or controls establishment in item 2) omit if same as label

a.

Address (Number and street)

b.

City or town

State

ZIP code

c.

2. Establishment for which this report is filed. (Omit if same as label)

a. Name of establishment

d.

Address (Number and street)

City or Town

County

State

ZIP code

e.

b. Employer identification No. (IRS 9-DIGIT TAX NUMBER)

f.

c. Was an EEO-1 report filed for this establishment last year? Yes No

Section C—EMPLOYERS WHO ARE REQUIRED TO FILE (To be answered by all employers)

Yes No 1. Does the entire company have at least 100 employees in the payroll period for which you are reporting?

Yes No 2. Is your company affiliated through common ownership and/or centralized management with other entities in an enterprise with a total employment of 100 or more?

Yes No 3. Does the company or any of its establishments (a) have 50 or more employees AND (b) is not exempt as provided by 41 CFR 60-1.5, AND either (1) is a prime government contractor or first-tier subcontractor, and has a contract, subcontract, or purchase order amounting to \$50,000 or more, or (2) serves as a depository of Government funds in any amount or is a financial institution which is an issuing and paying agent for U.S. Savings Bonds and Savings Notes?

If the response to question C-3 is yes, please enter your Dun and Bradstreet identification number (if you have one):

NOTE: If the answer is yes to questions 1, 2, or 3, complete the entire form, otherwise skip to Section G.

Section D-EMPLOYMENT DATA

Employment at this establishment - Report all permanent full- and part-time employees including apprentices and on-the-job trainees unless specifically excluded as set forth in the instructions. Enter the appropriate figures on all lines and in all columns. Blank spaces will be considered as zeros.

Job Categories	Number of Employees (Report employees in only one category)															Total Col A - N
	Race/Ethnicity															
	Hispanic or Latino		Not-Hispanic or Latino													
	Male	Female	Male						Female							
			White	Black or African American	Native Hawaiian or Other Pacific Islander	Asian	American Indian or Alaska Native	Two or more races	White	Black or African American	Native Hawaiian or Other Pacific Islander	Asian	American Indian or Alaska Native	Two or more races		
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O		
Executive/Senior Level Officials and Managers 1.1																
First/Mid-Level Officials and Managers 1.2																
Professionals 2																
Technicians 3																
Sales Workers 4																
Administrative Support Workers 5																
Craft Workers 6																
Operatives 7																
Laborers and Helpers 8																
Service Workers 9																
TOTAL 10																
PREVIOUS YEAR TOTAL 11																

1. Date(s) of payroll period used: _____ (Omit on the Consolidated Report.)

Section E - ESTABLISHMENT INFORMATION (Omit on the Consolidated Report.)

1. What is the major activity of this establishment? (Be specific, i.e., manufacturing steel castings, retail grocer, wholesale plumbing supplies, title insurance, etc. Include the specific type of product or type of service provided, as well as the principal business or industrial activity.)

Section F - REMARKS

Use this item to give any identification data appearing on the last EEO-1 report which differs from that given above, explain major changes in composition of reporting units and other pertinent information.

Section G - CERTIFICATION

Check 1 All reports are accurate and were prepared in accordance with the instructions. (Check on Consolidated Report only.)
 one 2 This report is accurate and was prepared in accordance with the instructions.

Name of Certifying Official	Title	Signature	Date
Name of person to contact regarding this report	Title	Address (Number and Street)	
City and State	Zip Code	Telephone No. (including Area Code and Extension)	Email Address

All reports and information obtained from individual reports will be kept confidential as required by Section 709(e) of Title VII. WILLFULLY FALSE STATEMENTS ON THIS REPORT ARE PUNISHABLE BY LAW, U.S. CODE, TITLE 18, SECTION 1001

**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/proposer 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) goal of **5.91%** participation (with a good faith effort of **3.89%** MBE and **2.02%** WBE, Effective July 1, 2013 thru June 30, 2016) has 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.*

The undersigned certifies that this bidder/proposer 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/best proposer 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/best proposer 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 _____ RFP/Contract _____

Authorized Signature _____

Title _____

**STATE OF ALASKA
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DISADVANTAGE BUSINESS ENTERPRISES
(MINORITY AND WOMEN-OWNED BUSINESS ENTERPRISES)
CONTACT DOCUMENTATION**

Project Name _____ **RFP/Contract No.** _____

Company Name _____ **Authorized Signature/Title** _____

This form is provided for your convenience to document your efforts in meeting DBE (MBE/WBE) utilization goals. 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 (explanations, advertising notices, solicitations, etc.) with your MBE/WBE Report of Participation.

Firm _____ **MBE** _____ **WBE** _____
Address _____

Type of Work _____ **Bid Amount \$** _____
Dates of Contact _____
Method of Contact _____
Contact's Name _____
Results of Contact _____
If rejected, why _____

Firm _____ **MBE** _____ **WBE** _____
Address _____

Type of Work _____ **Bid Amount \$** _____
Dates of Contact _____
Method of Contact _____
Contact's Name _____
Results of Contact _____
If rejected, why _____

Firm _____ **MBE** _____ **WBE** _____
Address _____

Type of Work _____ **Bid Amount \$** _____
Dates of Contact _____
Method of Contact _____
Contact's Name _____
Results of Contact _____
If rejected, why _____

APPENDIX G

ADOL Licensed Powderman
Standard and Regulations



Explosive Handler

Statutes and Regulations

February 2012

**Labor Standards and Safety Division
Mechanical Inspection**



**ALASKA DEPARTMENT OF LABOR
& WORKFORCE DEVELOPMENT**

Jobs are Alaska's Future

MECHANICAL INSPECTION CUSTOMER COUNTER LOCATIONS

Main Office MI - Anchorage

3301 Eagle Street, Ste 302
Anchorage, AK 99503
Office (907) 269-4925
Fax (907) 269-4932
Hours -8:00am-4:30pm

MI - Juneau

1111 West 8th Street
Juneau, AK 99802
Office (907) 465-4871
Fax (907) 465-3584
Hours -8:00am-4:30pm

MI - Fairbanks

675 7th Ave, Station H-2
Fairbanks, AK 99701
Office (907) 451-2887
Fax (907) 283-2967
Hours -8:00am-9:00am

MI - Sitka

304 Lake Street
Sitka, AK 99835
Office (907) 747-6380
Fax (907) 747-6657
Hours - By Appointment

WEB ADDRESSES

Certificate of Fitness

www.labor.state.ak.us/lss/mihome.htm
Applications and Licensing Information

Contractor Information

www.commerce.state.ak.us/occ/pcon.htm

Electrical Administrator

www.commerce.state.ak.us/occ/pead.htm
Electrical CEU Provider List

Mechanical Administrator

www.commerce.state.ak.us/occ/pmec.htm
Plumbing CEU Provider List

For Questions and Inquiries Email Mechanical Inspection

Anchorage.LLS-MI@alaska.gov

Note to Readers: The statutes and administrative regulations listed in this publication were taken from the official codes, as of the effective date of the publication. However, there may be errors or omissions that have not been identified and changes that occurred after the publication was printed. **This publication is intended as an informational guide only and is not intended to serve as a precise statement of the statutes and regulations of the State of Alaska. To be certain of the current laws and regulations, please refer to the official codes.**

STATUTES
Chapter 08.52. EXPLOSIVES HANDLERS

Sec. 08.52.010. Power to adopt regulations.

The Department of Labor and Workforce Development may issue orders and adopt regulations relating to the storage and use of explosives necessary to carry out the purposes of this chapter.

Sec. 08.52.020. Certificate of fitness required.

In connection with an excavation, tunnel, quarry, earth removal, or construction carried on in this state, a person may not be employed without a certificate of fitness, while engaged in

- (1) emplacing explosives for detonation;
- (2) installing primers, fuses, wires, or other means of detonation; or
- (3) detonating explosives.

Sec. 08.52.030. Application for and issuance of certificate.

The department shall issue certificates of fitness. A certificate may be issued only to an individual. An applicant for a certificate shall apply in writing, under oath, on a form prescribed by the department containing

- (1) the name and address of the applicant;
- (2) the applicant's age;
- (3) the applicant's citizenship;
- (4) the applicant's fingerprints and fees for a criminal background check conducted under AS 08.52.035; and
- (5) other information that the department requires.

Sec. 08.52.035. Criminal justice information and records.

(a) An applicant for the issuance or renewal of a certificate of fitness under this chapter shall submit to the department, with the application, the applicant's fingerprints and the fees required by the Department of Public Safety under AS 12.62.160 for criminal justice information and a national criminal history record check. The department shall submit the fingerprints to the Department of Public Safety to obtain a report of criminal justice information under AS 12.62 and a national criminal history record check under AS 12.62.400. The Department of Public Safety may submit the fingerprints to the Federal Bureau of Investigation for a national criminal

history record check. The department shall use the information obtained under this section in its determination of an applicant's qualification for issuance or renewal of a certificate of fitness.

(b) In this section, "criminal justice information" has the meaning given in [AS 12.62.900](#).

Sec. 08.52.040. Issuance and contents of certificate.

(a) If, upon investigation and examination by the department, the applicant is found competent by reason of training, experience, criminal history and background check, and physical fitness, the department shall issue a certificate of fitness. The certificate must set out the competency of the applicant and provide for positive identification of the applicant, and shall be carried on the person engaged in handling explosives.

(b) The department shall establish in regulation standards of competency based on training, experience, criminal history and background checks, and physical fitness for the issuance of a certificate of fitness.

Sec. 08.52.050. Fee.

An applicant for a certificate of fitness shall pay a fee at the time of application in the amount established by regulations adopted by the department.

Sec. 08.52.060. Duration of certificate.

A certificate of fitness is effective for three years from the date of issue. The department may cancel a certificate for cause.

Sec. 08.52.070. Persons exempt.

Persons employed in mining operations as defined in [AS 27.20.061](#) are exempt from the provisions of this chapter.

Sec. 08.52.080. Violations and penalties.

An employer who violates a provision of this chapter or a regulation adopted or order made under authority of this chapter is punishable by a fine of not more than \$1,000, or by imprisonment for not more than one year, or by both. Each day's continuance of a violation constitutes a separate offense.

Sec. 08.52.100. Definition.

In this chapter, "department" means the Department of Labor and Workforce Development.

REGULATIONS
Article 11
Occupational Safety and Health Standards

8 AAC 61.1020. Additional explosive and blasting standards

(a) In addition to the requirements set out in 29 C.F.R. 1910.109 (e), as amended, an employer shall ensure the following:

(1) all employees doing excavation, tunnel, quarry, earth removal, or construction work, and who are emplacing explosives for detonation, installing primers, fuses, wires, or other means of detonation, or detonating explosives, are required to obtain a certificate of fitness for explosive handlers issued by the department, the standards and application procedures for certificate of fitness for explosive handlers are contained in 8 AAC 62.020 - 8 AAC 62.070;

(2) an employee handling explosive materials shall be supervised by a holder of a certificate of fitness for explosive handlers and shall be at least 18 years of age.

(b) Notwithstanding 29 C.F.R. 1910.109(e)(1)(v), if fewer than six hours of daylight will occur in a 24-hour period, blasting operations may be performed at night if the employer ensures that the following additional safety requirements for employees are met:

(1) all affected employees must be notified before night-time blasting operations are begun; notification must be by verbal communication and by posting a notice in a place where notices to employees are usually posted by the employer;

(2) the department must be notified at least 72 hours before blasting work is begun, indicating the location where blasting will be done and the approximate length of time the blasting will be in progress; upon completion of the blasting operations, the department must be notified of completion;

(3) written procedures on how night blasting operations will be controlled must be made available upon request to the department when blasting is to be done within one-half mile of populated areas; these procedures must show the specific precautions that will be taken to ensure control of the site where blasting will be done and must place an emphasis on the protection of employees;

(4) the blaster must have a current state certificate of fitness for explosive handling and must be designated in writing by the employer for each night-blasting project; the blaster shall be responsible for all activities of employees within the blasting area and within 100 feet of the blasting area; the blaster shall control access by employees to this area;

(5) a minimum of four mobile flood light complexes must be used to illuminate the

blasting area; each flood light complex must have its own generator plant, complete with four 1,000 watt flood lights, and must be capable of illuminating the blasting area so that there will be no shadows or darkened areas; additional flood light complexes must be brought into use if the blaster considers them necessary for safe operations to protect employees;

(6) the employer shall control access to the entire site to ensure that an employee does not enter unsafe areas during the blast;

(7) the blaster must be protected from flying rock by either adequate shelter or by keeping a safe distance from the blast; all other employees shall leave the blast site and keep a sufficient distance away from flying rock due to the blast;

(8) after the blast, and before any employees or equipment enter the blast site, the flood light complexes must be repositioned to illuminate the site as specified by the blaster; the blaster shall examine the area for misfires, loose explosives, or other hazards; handheld battery-powered lamps, approved by a nationally recognized testing laboratory as defined in 29 C.F.R. 19 for use in hazardous locations, may be used to supplement the flood light complexes during this examination; an employee may not enter the area until the blaster gives clearance to do so.

(c) In this section, "night" or "night time" means the hours from one-half hour after sunset to one-half hour before sunrise. (Eff. 12/6/95, Register 136)

Authority: AS 18.60.020 AS 18.60.030 AS 18.60.075

Chapter 62
Explosives Handlers

Section

- 10. (Repealed).
- 20. Applications for certificates.
- 30. General certificate of fitness.
- 35. Duplicate certificate of fitness.
- 40. (Repealed).
- 50. Examinations.
- 55. Renewal of certificate of fitness.
- 56. Renewal of a lapsed certificate of fitness.
- 59. Training requirements.
- 60. Revocation of certificate of fitness.
- 65. Appeals.
- 70. Definitions.

8 AAC 62.010. Certificate of fitness required

Repealed 5/26/79.

8 AAC 62.020. Applications for certificates

(a) All persons handling explosives who are required by [AS 08.52.020](#) to hold a certificate of fitness shall apply for a certificate in writing on a form prescribed by the department. The application must include the following information:

- (1) applicant's name and address;
- (2) applicant's age;
- (3) applicant's citizenship;
- (4) applicant's employment history;
- (5) applicant's physical disabilities;
- (6) whether applicant has ever been licensed as an explosive handler;
- (7) whether applicant has ever been refused a license and the reason for the refusal;

- (8) whether applicant's explosive handler's license was ever revoked;
- (9) whether the applicant is under indictment for or has been convicted of a crime as described in 18 U.S.C. 842(i)(1) or 8 AAC 62.030(a) (6);
- (10) documentation of completion of a training course that meets the requirements of 8 AAC 62.059;
- (11) information related to any of the factors listed in 18 U.S.C. 842(i)(1) - (7).

(b) The application must include two copies of the applicant's fingerprints and fees as required under AS 08.52.035, except that an applicant may instead submit the applicant's original documentation issued by the United States Bureau of Alcohol, Tobacco, Firearms and Explosives (USATFE) showing the applicant's successful background check conducted within the 18 months preceding the date of application by USATFE for the purposes of obtaining a federal license for the transportation, shipping, receiving, or possession of explosive materials.

History: Eff. 1/2/71, Register 36; am 5/26/79, Register 70; am 9/27/2008, Register 187; am 2/ 23/2011, Register 197)

Authority: AS 08.52.010 AS 08.52.030 AS 08.52.035

Editor's note: With Register 179, October 2006 and under the authority of AS 44.62.125 , the regulations attorney changed obsolete terminology concerning persons with disabilities in conformity with ch. 25, SLA 2006.

8 AAC 62.030. General certificate of fitness

A certificate of fitness authorizes the holder to use explosives in connection with activities described in AS 08.52.020 , if the use of the explosives is not otherwise prohibited by law. A certificate of fitness, effective for three years after the date of issue, will be issued by the department if the applicant

- (1) passes an examination provided by the department;
- (2) has at least six months of documented, hands-on experience in this state as a chuck tender, driller, or helper of a holder of a certificate of fitness;
- (3) is not afflicted with a mental or physical disability that could affect the applicant's safe handling and use of explosives;
- (4) pays a \$150 fee;
- (5) is not under indictment for, and has not been convicted of, a crime as described in 18 U.S.C. 842(i)(1);
- (6) is not under indictment for, and has not been convicted of, any of the following

crimes:

(A) a misdemeanor, including an attempted misdemeanor, under AS 11.41

(Offenses Against the Person), or an offense under a law or ordinance of another jurisdiction having elements similar to that offense;

(B) a misdemeanor, including an attempted misdemeanor, under AS 11.46 (Offenses Against Property), or an offense under a law or ordinance of another jurisdiction having elements similar to that offense;

(C) a misdemeanor involving domestic violence; in this subparagraph, "misdemeanor involving domestic violence" means a misdemeanor within the meaning of "crime involving domestic violence" in AS 18.66.990 ; and

(7) would not be prohibited from transporting, possessing, storing, or manufacturing explosives under 18 U.S.C. 842(i)(2) - (7).

History: Eff. 1/2/71, Register 36; am 5/26/79, Register 70; am 7/31/86, Register 99; am 11/7/93, Register 128; am 9/27/2008, Register 187

Authority: AS 08.52.010 AS 08.52.020 AS 08.52.030 AS 08.52.040 AS 08.52.050

Editor's note: With Register 179, October 2006 and under the authority of AS 44.62.125 , the regulations attorney changed obsolete terminology concerning persons with disabilities in conformity with ch. 25, SLA 2006.

8 AAC 62.035. Duplicate certificate of fitness

Upon losing a certificate of fitness identification card, the holder shall immediately notify the mechanical inspection section of the department. The cardholder may apply for a duplicate certificate of fitness by paying a \$25 fee and providing a government-issued identification card containing the individual's photograph.

History: Eff. 6/14/2006, Register 178

Authority: AS 08.52.010 AS 08.52.020 AS 08.52.030 AS 08.52.040 AS 08.52.050

8 AAC 62.040. Special certificate of fitness

Repealed 5/26/79.

8 AAC 62.050. Examinations

If an applicant fails to pass the examination, another examination will be given at the request of the applicant, if at least 30 days have elapsed from the date of the first examination. Only two examinations will be given in a six-month period.

History: Eff. 1/2/71, Register 36; am 5/26/79, Register 70

Authority: AS 08.52.010 AS 08.52.040

8 AAC 62.055. Renewal of certificate of fitness

- (a) A certificate of fitness is effective for three years after the date of issue, and may be renewed without reexamination if the certificate holder
 - (1) submits an updated application on a form prescribed by the department within 30 calendar days after the expiration date of the certificate; and
 - (2) pays a \$150 fee; and
 - (3) provides proof of having completed, within 18 months before application for renewal,
 - (A) the 32-hour initial training course required under 8 AAC 62.059; or
 - (B) the eight-hour refresher course required under 8 AAC 62.059.
- (b) In its discretion, the department will refuse to renew a certificate for cause.
- (c) When the department refuses to renew a certificate, the applicant will be
 - (1) promptly notified in writing of the reason for the refusal; and
 - (2) advised in writing that the applicant has the right to appeal the refusal action to the commissioner.
- (d) The application must include two copies of the applicant's fingerprints and fees as required under AS 08.52.035, except that an applicant may instead submit the applicant's original documentation issued by the United States Bureau of Alcohol, Tobacco, Firearms and Explosives (USATFE) showing the applicant's successful background check conducted within the 18 months preceding the date of application by USATFE for the purposes of obtaining a federal license for the transportation, shipping, receiving, or possession of explosive materials.

History: Eff. 5/26/79, Register 70; am 7/31/86, Register 99; am 11/7/93, Register 128; am 9/27/2008, Register 187

Authority: AS 08.52.010 AS 08.52.030 AS 08.52.035 AS 08.52.040 AS 08.52.050

8 AAC 62.056. Renewal of a lapsed certificate of fitness

- (a) If a certificate of fitness is not renewed on or before its expiration date as established under AS 08.52.060 , the certificate of fitness lapses.
- (b) If a certificate of fitness is lapsed no more than 12 months, the holder may apply for renewal under 8 AAC 62.055. An applicant for renewal under this subsection must meet the requirements of 8 AAC 62.055. The applicant is not required to pass an examination.
- (c) If a certificate of fitness is lapsed more than 12 months and less than five years, the holder may apply for renewal under 8 AAC 62.055. In addition to meeting the requirements of 8 AAC 62.055, an applicant for renewal under this subsection must re-take and pass the examination required under 8 AAC 62.030(1) .
- (d) A certificate of fitness may not be renewed if it has been lapsed for five years or more.

History: Eff. 9/27/2008, Register 187

Authority: AS 08.52.010 AS 08.52.030 AS 08.52.040 AS 08.52.060

8 AAC 62.059. Training requirements

- (a) For an applicant for a certificate of fitness to satisfy the training course requirement in 8 AAC 62.020, or for an applicant for renewal of a certificate to meet the refresher course requirement in 8 AAC 62.055, the applicant must document that the course provides at least
 - (1) 32 hours of instruction in the subject areas listed in (b) of this section, if the course is an initial training course;
 - (2) eight hours of instruction in the subject areas listed in (b) of this section, if the course is a refresher course.
- (b) An initial or refresher course must include instruction in each of the following subject areas:
 - (1) an introduction to being an explosives handler;
 - (2) federal statutes and regulations that pertain to explosives handlers;
 - (3) statutes and regulations of this state that pertain to explosives handlers;
 - (4) types and properties of explosives;
 - (5) initiation systems;

- (6) blast design;
- (7) environmental effects controlling blasting damage;
- (8) priming and loading operations;
- (9) blasting safety practices;
- (10) transportation, recordkeeping, and cold weather operations;
- (11) blasting calculations.

History: Eff. 9/27/2008, Register 187

Authority: AS 08.52.010 AS 08.52.030 AS 08.52.040

8 AAC 62.060. Revocation of certificate of fitness

- (a) The department will, in its discretion, revoke a certificate of fitness for cause. The director will hold a hearing to take testimony and will consider the testimony before a decision is made whether to revoke the certificate.
- (b) When the department revokes a certificate, the certificate holder will be
 - (1) promptly notified in writing of the reason for the revocation; and
 - (2) advised in writing of the right to appeal the revocation action to the commissioner.
- (c) A person whose certificate is revoked under this section shall surrender the certificate to the department. A person is ineligible to obtain a new certificate for a period of at least 90 days, but not exceeding one year, after the date of revocation, as determined by the department.

History: Eff. 1/2/71, Register 36; am 5/26/79, Register 70; am 7/31/86, Register 99

Authority: AS 08.52.010 AS 08.52.060

8 AAC 62.065. Appeals

- (a) A revocation under 8 AAC 62.060 or a refusal by the department to renew a certificate under 8 AAC 62.055 is final unless the person affected files an appeal with the commissioner within 30 calendar days after receipt of the notice of refusal or revocation. The appeal must be in writing and must include
 - (1) a specification of objections to the department's findings, and a concise summary of

facts in support of each objection; and

(2) a description of the relief which is sought.

(b) The commissioner's decision will be based upon the departmental record and will state the facts relied upon by the commissioner in deciding the matter.

(c) In his discretion, the commissioner will hold a hearing on the appeal to supplement the departmental record where clarification or additional facts are necessary for a proper resolution of the appeal.

(d) A copy of the commissioner's decision will be sent to the appellant by certified mail.

History: Eff. 5/26/79, Register 70

Authority: AS 08.52.010 AS 08.52.040

8 AAC 62.070. Definitions

In 8 AAC 62.010 - 8 AAC 62.065

(1) "cause" means

(A) providing false information on the application furnished by the applicant or certificate holder to the department;

(B) evidence of improper handling, transportation, use, or storage of explosives by the applicant or certificate holder;

(C) a mental or physical disability that, even with reasonable accommodation, would interfere with the applicant or certificate holder's safe handling of explosives;

(D) the applicant's or certificate holder's indictment for or conviction of a crime as described in 18 U.S.C. 842(i)(1) or 8 AAC 62.030(a) (6);

(E) prohibition of the applicant or certificate holder from transporting, possessing, storing, or manufacturing explosives under 18 U.S.C. 842(i)(2) - (7); or

(F) other conduct considered by the department to show the applicant not to be competent to hold a certificate of fitness as set out in 8 AAC 62.020(a) ;

(2) "commissioner" means the Commissioner of Labor and Workforce Development or his designee;

- (3) "department" means the Department of Labor and Workforce Development;
- (4) "director" means the director of the division of labor standards and safety, Department of Labor and Workforce Development, or a designee;
- (5) "examination" means a series of prepared questions administered either in writing or orally;
- (6) "convicted" or "conviction" means a judgment entered by a court of competent jurisdiction in this state or another jurisdiction, either upon the entry of a plea, including a plea of no contest or nolo contendere, or after a bench or jury trial; "convicted" or "conviction"
 - (A) includes a suspended imposition of sentence, even if the conviction is formally set aside under AS 12.55.085 ; and
 - (B) does not include an executive order of clemency, or a record that has been expunged by order of a court;
- (7) "indictment" means one of the following, pending adjudication or dismissal of the matter, or a decision by the district attorney's office not to prosecute:
 - (A) an indictment by information or presentment for an offense;
 - (B) an arrest and provision of a uniform summons and complaint for an offense.

History: Eff. 1/2/71, Register 36; am 5/26/79, Register 70; am 10/2/83, Register 87; am 9/27/2008, Register 187

Authority: AS 08.52.010 AS 08.52.040

Editor's note: As of Register 151 (October 1999), the regulations attorney made technical revisions under AS 44.62.125 (b)(6) to reflect the name change of the Department of Labor to the Department of Labor and Workforce Development made by ch. 58, SLA 1999 and the corresponding title change of the commissioner of labor.