TECHNICAL SPECIFICATIONS

SECTION 01 10 00

SUMMARY OF WORK

PART 1 GENERAL

This Summary of Work supplements and amplifies certain sections of the General Conditions. The General Conditions shall apply except as modified herein. These Special Provisions and additional technical specifications may contain occasional requirements not pertinent to the project. However, these specifications shall apply in all particulars insofar as they are applicable to this project.

1.1 APPLICABLE STANDARD SPECIFICATIONS AND PLANS

A. The following references apply except as may be modified herein. In the case of discrepancy, unless noted otherwise herein, the more restrictive provisions shall apply.

B. The requirements of the City of Roseburg Public Works Department.

C. Most current edition of the Oregon Standard Specifications for Construction, Oregon Department of Transportation, herein referred to as “Standard Specifications”.

D. Most current edition of the Oregon Standard Drawings and Details, Oregon Department of Transportation, herein referred to as “Standard Plans”.

E. Roseburg Urban Sanitary Authority Specifications.

1.2 SCOPE OF WORK

The work to be performed under these specifications and drawings consists of construction of a new 24-inch potable water transmission main from West Avenue to the City’s Main Reservoir site and a 24-inch intertie along West Avenue, including approximately 1,556 linear feet of restrained 24-inch diameter ductile iron (DI) pipe, fittings, valves, combination air release valves and low point blow-off assemblies, corrosion monitoring system, connection to existing transmission main piping and reservoir piping, surface restoration, pavement restoration, and the performance of any other work as called for by the project drawings and specifications.

The above general outline of principal features of the work does not in any way limit the responsibility of the CONTRACTOR(s) to perform all work and furnish all equipment, labor and materials required by the specifications and drawings. The drawings and specifications shall be considered and used together. Anything appearing as a requirement of either shall be accepted as applicable to both even though not so stated therein or shown.

No attempt has been made in these specifications or drawings to segregate work covered

by any trade or subcontract under one specification. Such segregation and establishment of subcontract limits will be solely a matter of specific agreement between the CONTRACTOR and its subcontractors and shall not be based upon any inclusion, segregation or arrangement in or of these specifications.

1.3 COORDINATION OF DRAWINGS AND SPECIFICATIONS

The drawings and specifications are intended to describe and provide for a complete work. Any requirement in one is as binding as if stated in all. The CONTRACTOR shall provide any work or materials clearly implied in the Contract Documents even if the Contract Documents do not mention it specifically. If there is a conflict within the Contract Documents, it will be resolved by the following order of precedence:

A. Permits for outside agencies required by law
B. OWNER-CONTRACTOR Agreement
C. Addenda to Contract Documents
D. CONTRACTOR's Proposal
E. Special Provisions
F. Contract Drawings
G. Technical Specifications
H. Supplementary General Conditions
I. General Conditions of the Contract

Dimensions shown on the drawings or that can be computed shall take precedence over scaled dimensions. Notes on drawings are part of the drawings and govern in the order described above. Notes on drawings shall take precedence over drawing details.

The intent of the drawings and specifications is to prescribe the details for the construction and completion of the work which the CONTRACTOR undertakes to perform according to the terms of the Contract. Where the drawings or specifications describe portions of the work in general terms, but details are incomplete or silent, it is understood that only the best general practice is to prevail and that only materials and workmanship of the best quality are to be used. Unless otherwise specified, the CONTRACTOR shall furnish all labor, materials, tools, equipment, and incidentals, and do all the work involved in executing the Contract in a manner satisfactory to the ENGINEER.

The contract drawings are designated by general title, sheet number and sheet title. When reference is made to the drawings, the "Sheet Number" of the drawing will be used. Each drawing bears the ENGINEER's File No. 18-2368 and the general title:

CITY OF ROSEBURG
WEST AVENUE WATER MAIN EXTENSION

The specific titles of each sheet are contained on Sheet G-1.

1.4 CODE REQUIREMENTS

All work shall be done in strict compliance with the requirements of:

A. International Building Code
B. Uniform Mechanical Code
C. Uniform Plumbing Code
D. National Electric Code
E. National Electric Safety Code
F. Oregon State Department of Labor and Industries
G. City of Roseburg – Code of Ordinances
H. Roseburg Urban Sanitary Authority (RUSA) Codes

In case of disagreement between codes or these specifications, the more restrictive shall prevail.

1.5 TIME OF COMPLETION/LIQUIDATED DAMAGES

The CONTRACTOR shall complete all work shown and specified within the time limits stated in the Agreement (See Section 01 33 00, Submittal Procedures, for project schedule submittal requirements). The written Notice to Proceed will be sent to the CONTRACTOR after the CONTRACTOR submits the signed Contract, Bonds and insurance certificates to the OWNER and those documents have been approved as to form and executed by the OWNER. The CONTRACTOR's attention is directed to Item No. 11 of the Bid Form, Item No. 4 of the Construction Contract, and the General Conditions as respects liquidated damages.

1.6 COORDINATION WITH OTHER CONTRACTORS AND WITH OWNER

Certain work within this contract may require connection to and coordination with the work of other contractors and OWNER. The CONTRACTOR under these specifications shall cooperate fully with all other contractors and OWNER and carefully fit its own work to such other work as may be directed by the ENGINEER. The CONTRACTOR shall not commit or permit any act to be committed which will interfere with the performance of work by any other contractor or the OWNER.

1.7 ACCESS TO WORK

Access to the work shall be provided as may be required by the OWNER or its representatives, and all authorized representatives of the state and federal governments and any other agencies having jurisdiction over any phase of the work, for inspection of the progress of the work, the methods of construction or any other required purposes.

1.8 PERMITS AND LICENSES

Unless provided for otherwise in these contract documents, all permits, licenses and fees shall be obtained by the CONTRACTOR and all costs shall be borne by the CONTRACTOR.

CONTRACTOR shall pay all plan check fees and other fees necessary to obtain permits and shall accommodate special inspections required thereof. CONTRACTOR shall be responsible for compliance with all permit provisions and shall accommodate all special inspections required thereof, all at no additional expense to the OWNER beyond prices as bid.

A. The following permit application has been obtained by the OWNER and will be transferred to Contractor not less than 30 days prior to work commencing (Contractor to submit request to DEQ for permit transfer):

   - NDPES Stormwater Discharge DEQ 1200-C

B. The following permit application has been obtained by the OWNER for removal/fill work within delineated wetland areas:

   - General Authorization Notification Form to DSL (Oregon) for a DSL General Authorization (GA) Removal-Fill Permit

1200-C Permit application (and transfer form) and General Conditions for DSL GA removal/fill permit have been included in the Supplementary Information section at the end of the Technical Specifications.

See Item No. No. 1.38, Erosion and Sedimentation Control, and 1.49 below, Work within Waters of the State.

1.9 SITE INVESTIGATION AND PHYSICAL DATA

The CONTRACTOR acknowledges that it is satisfied as to the nature and location of the work and the general and local conditions, including but not limited to those bearing upon transportation, disposal, handling and storage of materials, availability of water, roads, groundwater, access to the sites, coordination with other contractors, and conflicts with pipelines, structures and other contractors. Information and data furnished or referred to herein is furnished for information only. Any failure by the CONTRACTOR to become acquainted with the available information and existing conditions will not be a basis for relief from successfully performing the work and will not constitute justification for additional compensation.

The CONTRACTOR shall verify the locations and elevations of existing pipelines, structures, grades and utilities, prior to construction. The OWNER assumes no responsibility for any conclusions or interpretations made by the CONTRACTOR on the basis of the information made available.

1.10 TEMPORARY UTILITIES FOR CONSTRUCTION PURPOSES

The CONTRACTOR shall make all arrangements necessary to provide all temporary utilities for construction purposes and shall pay all costs associated those temporary utilities. Water

for construction purposes will be furnished by the OWNER at no cost. The CONTRACTOR shall make its own arrangements for obtaining a potable water supply for flushing, testing, and disinfection of the pipelines and appurtenant facilities. Water supply may be made available to the contractor from the City of Roseburg water system depending upon the operational status of its existing reservoirs, water demands, other water needs, and other factors.

The CONTRACTOR shall furnish all valves, hoses, connections and other devices as necessary to obtain sufficient water for construction and for filling and testing of water lines as required. Water supply fire hydrant use is allowed only by permission of the utility owner. Backflow protection is required on all connections to potable water systems.

1.11 FIELD SERVICE BY MANUFACTURER'S REPRESENTATIVE

The CONTRACTOR shall furnish the services of a manufacturer's or material supplier's representative for all major equipment and materials furnished by the CONTRACTOR or OWNER under this contract, to check, place in operation and test the installation, and train operating personnel. The manufacturer's representative shall be qualified and authorized to perform repairs and maintenance on the equipment. The above gives a general scope of the services desired from the manufacturer's representative. It will be the responsibility of the CONTRACTOR and the equipment manufacturer to determine detailed requirements. Costs for services of the manufacturer's representative shall be included in the proposal of the CONTRACTOR. The operator training mentioned above shall include sufficient time during the CONTRACTOR's operation and testing period to fully explain to the operating personnel the features of the equipment and maintenance thereof.

1.12 CONSTRUCTION WITHIN PUBLIC RIGHTS-OF-WAY

When the work contemplated is wholly or partly within the right-of-way of a public agency such as a city, county or state, the OWNER will obtain from these agencies any right-of-way and street opening permits and all other necessary permit(s) required for the work. The CONTRACTOR shall abide by all regulations and conditions stipulated in the permit(s). Such conditions and requirements are hereby made a part of these specifications, as fully and completely as though the same were fully set forth herein. The CONTRACTOR shall examine the permit(s) granted to the OWNER by any city, county, state and federal agencies. Failure to do so will not relieve the CONTRACTOR from compliance with the requirements stated therein.

The CONTRACTOR shall obtain all construction permits and pay all fees or charges and furnish any bonds and insurance coverages as necessary to insure that all requirements of the city, county, state or federal agencies will be observed and the roadway and ditches are restored to their original condition or one equally satisfactory. A copy of all permits shall be kept on the work site for use of the ENGINEER.

The following permits are to be obtained by the Contractor:

- City of Roseburg Street Closure Permit (with Traffic Control Plan submittal)

1.13 CONSTRUCTION WITHIN PRIVATE EASEMENTS

When portions of the work contemplated are within easements held by the OWNER on private property, the CONTRACTOR shall ascertain for itself to what extent the width, status and special conditions attached to easements may have on its operations and all costs resulting therefrom shall be included and absorbed in the unit prices of the CONTRACTOR's bid. CONTRACTOR shall coordinate with private property owners and businesses if required. Landscaping, surface restoration and fence restoration shall be completed within 24 hours following piping and conduit installation and other construction work. Temporary fencing shall be provided continuously until such private fencing is properly restored.

The CONTRACTOR's attention is directed to Paragraph 3.10 of the General Conditions regarding safety and the protection of property. Certain portions of this project require working in close proximity to existing structures and property within private easements. It is the CONTRACTOR'S responsibility to conduct its operations and limit the size of equipment used in such a manner so as to prevent damage to existing property from excessive vibration or from other direct or indirect CONTRACTOR operations. The cost associated with repairing or replacing property that is damaged by the CONTRACTOR's operations shall be the responsibility of the CONTRACTOR, in accordance with the General Conditions.

1.14 RAILROAD CROSSINGS – NOT USED

1.15 PRIVATE ROADS AND DRIVEWAYS

Bridges at entrances to business properties where vehicular traffic is necessary shall be provided and maintained. Bridges shall be adequate in width and strength for the service required. No private road or driveway may be closed without approval of the ENGINEER unless written authority has been given by the owner whose property has been affected. Driveways shall be left open and ready for use at the end of the work shift. All expenses involved in providing for construction, maintenance, and use of private roads or driveways, shall be borne by the CONTRACTOR and the amount thereof absorbed in the unit prices of the CONTRACTOR's bid.

1.16 TRAFFIC CONTROL AND PROTECTION

The CONTRACTOR shall maintain traffic control and protection in all of the work areas twenty-four (24) hours per day. Traffic control shall conform to the standards set forth in the latest edition of the "Manual on Uniform Traffic Control Devices for Streets And Highways" (MUTCD) and any modifications to that manual contained herein or any other requirements as prescribed by any agency with authority over the project.

Prior to beginning construction, the CONTRACTOR shall submit a detailed street closure and traffic control plan to the ENGINEER. This plan shall address any traffic impacts to NE West

Avenue, Walnut Street, NE Post Street, NE Alder Street, and NE Stephens Street. The closure and traffic control plan shall be prepared in accordance with the Oregon Department of Transportation Traffic Control Plans Design Manual. This plan shall be organized to address the closure and traffic control requirements of the MUTCD and the City of Roseburg. The ENGINEER will submit the plan to the City of Roseburg for their review. The CONTRACTOR shall modify or correct the plan and resubmit the plan, as required by either agency, as necessary to obtain approval. Construction may not proceed until approval has been obtained.

All work shall be carried on with due regard for safety to the public. Work zone areas shall be provided with barricades of a type that can be seen at a reasonable distance. Work zone areas shall be distinctly indicated at night by adequately placed lighting which shall consist of a minimum of two lighting plants within the work zone. The CONTRACTOR shall designate an individual on the project to be its traffic control superintendent. The CONTRACTOR shall work with the OWNER in support of its public relations program as described elsewhere in this Summary of Work to provide notification of construction activities and road closures to the City of Roseburg and local residents, businesses, school districts, and other institutions and agencies.

1.17 MATERIALS AND COMPACTION TESTING

The CONTRACTOR shall provide, at no additional cost to the OWNER, the services of a licensed, independent agency to perform materials and compaction testing for this project. The agency must be approved by the ENGINEER. The scope of services to be performed by the agency include the following: soil and aggregate classification and testing; soil and aggregate compaction testing; concrete strength testing; and hot mixed asphalt concrete (HMAC) testing and compaction. Materials and compaction tests will be required to show that specified densities of compacted backfill and asphaltic concrete surfacing are being achieved by the CONTRACTOR's compaction methods. The CONTRACTOR shall provide the ENGINEER with copies of recent Proctor tests for the backfill and paving material in addition to copies of compaction tests performed in the field.

After the ENGINEER is satisfied that the CONTRACTOR's method of compaction consistently meets specified compaction requirements, the testing frequency may be reduced. The ENGINEER may direct testing at a higher frequency upon failure to obtain specified densities or if the CONTRACTOR changes compaction equipment or methods of compaction. All test locations shall be determined by the ENGINEER.

1.18 DECHLORINATION AND DISPOSAL OF CHLORINATED WATER

Any discharge of chlorinated water shall either be through an approved connection to a public sanitary sewer system or shall include dechlorination to limits acceptable by the Oregon State Department of Environmental Quality (DEQ) for discharge into the existing storm drainage system. No chlorinated water shall be discharged into the storm drainage system prior to approved dechlorination treatment.

1.19 LIMITS OF THE WORK AND STOCKPILE AND STAGING PLAN

The limits of the site which may be used for construction, storage, materials handling, parking of vehicles and other operations related to the project include the project site as shown on the drawings and adjacent public rights-of-way subject to permission of the public owner of that right-of-way. The limits of work also include rights of access obtained by the CONTRACTOR, subject to all public laws and regulations and rights of access by utility companies and other holders of easement rights.

The CONTRACTOR shall submit a stockpile and staging plan to the ENGINEER. This plan will describe the CONTRACTOR's plan for stockpiling and staging of construction materials and equipment on the project site. This plan will include no stockpiling of materials allowed on the non-trenched lanes. Stockpiling of materials will only be allowed on areas where the pavement is being overlaid.

If the CONTRACTOR makes arrangements with private or public land owners for use of property outside of public rights-of-way for stockpiling and staging, then the CONTRACTOR shall submit documentation to the ENGINEER that the CONTRACTOR's warrants that its activities comply with all environmental, land use and any other requirements under all Federal, State and local statutes and codes. The CONTRACTOR shall also submit documentation of permission from the property owner for the proposed activity. Upon completion of construction, the CONTRACTOR shall submit to the ENGINEER a release from the property owner confirming that the property has been restored to the satisfaction of the owner and that all obligations have been satisfied.

1.20 EXISTING WATER SYSTEM SHUTDOWN

If the project involves the need to shut down an existing water system, the CONTRACTOR shall coordinate the work to insure a minimum of shutdown time. The CONTRACTOR shall submit a written shutdown schedule to the ENGINEER for approval per the Specifications. See Section 01 12 16, *Work Sequence and Schedule Constraints*, for requirements.

1.21 FIELD CHANGES, ALIGNMENT AND GRADE

Changes of alignment and grade shall be made during the course of work in order to avoid interference with unforeseen obstructions. The CONTRACTOR shall locate existing utilities to be crossed, by potholing ahead of the pipe installation, of sufficient distance to avoid conflicts through pipe joint deflection if possible. All costs for minor field changes of alignment and grade shall be borne by the CONTRACTOR. The ENGINEER will endeavor to make prompt decisions on such matters. CONTRACTOR shall anticipate a minimum of 72 hours for any decision requiring significant piping change.

1.22 TESTING AND OPERATION OF FACILITIES

It is the intent of the OWNER to have a complete and operable facility. All of the work under

this contract will be fully tested and inspected in accordance with the specifications. Upon completion of the work, the CONTRACTOR shall operate the completed facilities as required to test the equipment under the direction of the ENGINEER. During this period of operation by the CONTRACTOR, the new facilities will be tested thoroughly to determine their acceptance.

1.23 PROTECTION OF EXISTING STRUCTURES AND WORK

The CONTRACTOR must take all precautions and measures necessary to protect all existing structures and work. Any damage to existing structures and work shall be repaired by removing the damaged structure or work, replacing the work and restoring to original condition satisfactory to the ENGINEER.

1.24 SALVAGE AND DEBRIS

Unless otherwise indicated on the drawings or in the specifications, all castings, pipe, equipment, demolition debris, spoil or any other discarded material or equipment shall become the property of the CONTRACTOR and shall be disposed of in a manner compliant with applicable Federal State and local laws and regulations governing disposal of such waste products. No burning of debris or any other discarded material will be permitted.

1.25 SAFETY STANDARDS AND ACCIDENT PREVENTION

The CONTRACTOR shall be solely and completely responsible for conditions of the job site, including safety of all persons and property during performance of the work. This requirement shall apply continuously and not be limited to normal working hours. The required and/or implied duty of the ENGINEER to conduct construction review of the CONTRACTOR's performance does not, and is not intended to, include review of the adequacy of the CONTRACTOR's safety measures in, on, or near the construction site.

The CONTRACTOR shall comply with the safety standards provisions of applicable laws and building and construction codes. The CONTRACTOR shall exercise every precaution at all times for the prevention of accidents and protection of persons, including employees, and property. During the execution of the work the CONTRACTOR shall provide and maintain all guards, railing, lights, warnings, and other protective devices which are required by law or which are reasonably necessary for the protection of persons and property from injury or damage.

1.26 PUBLIC SAFETY AND CONVENIENCE

General Rule: The CONTRACTOR shall ensure the safety of the public during its performance of the Work and shall minimize any public inconvenience in addition to any other requirement imposed by law. These duties include, but are not limited to, the matters listed below.

Access: The CONTRACTOR shall not unreasonably restrict access to public facilities,

commercial property, fire hydrants, residential property, and other areas where the public can be expected to be present, such as sidewalks and streets without first obtaining approval of the OWNER. Driveways shall be closed only with the approval of the OWNER or after obtaining specific permission from the property owner or owners. In addition, the CONTRACTOR shall not obstruct or interfere with travel over any public street or sidewalk without approval of the OWNER.

Public Transit: The CONTRACTOR shall not interfere with the normal operation of any public transit vehicles unless otherwise authorized.

Work Site: The CONTRACTOR shall keep the Project site safe in compliance with applicable law. Safety includes, but is not limited to: 1) providing an approved type of secured and adequate barricades or fences that are easily visible from a reasonable distance around open excavations; 2) closing up or covering with steel plates all open excavations at the end of each Working Day in all street areas and in all other areas when it is reasonably required for public safety; 3) marking all open work and obstructions by lights at night; 4) installing and maintaining all necessary signs, lights, flares, barricades, railings, runways, stairs, bridges, and facilities; 5) observing any and all safety instructions received from the OWNER; and 6) following all laws and regulations concerning worker and public safety. In the event that the law requires greater safety obligations than that imposed by the OWNER, the CONTRACTOR shall comply with the law.

Emergency: Emergency vehicles, including but not limited to police, fire, and disaster units shall be provided access to the work site at all times.

Cleanliness: The CONTRACTOR shall, on a continuing basis, keep the surfaces of all public and private roadways, sidewalks, and other pathways free of dirt, mud, cold plane grindings, and other matters that the CONTRACTOR may place upon the road. The cost of performing such work shall be included in the CONTRACTOR's Bid and no additional payment will be made for performing this task.

Parking: Construction-related vehicles, including equipment and CONTRACTOR's employee's vehicles, shall not park along or in public or private roadways. This requirement may be waived should written permission be obtained by the governing jurisdiction or property owners. The CONTRACTOR shall make any necessary contacts with all applicable governmental bodies to arrange for the removal of parked automobiles, vehicles and other obstructions if they would interfere with the performance of the CONTRACTOR'S work.

Accidents: The CONTRACTOR'S Project Manager or superintendent shall be in charge of accident prevention. CONTRACTOR shall take all actions necessary to prevent damage, injury and loss to persons and property as a result of accidents.

The OWNER has no responsibility for Work site safety. Work site safety is the responsibility of the CONTRACTOR. The CONTRACTOR is required to have a competent person on site at all times during construction activities.

The CONTRACTOR shall provide signs on work zone fencing that provide information regarding access to businesses and stating that such businesses are open and in operation. The CONTRACTOR shall furnish and install the signs and provide sign attachments for the various business names.

1.27 WARRANTY PERIOD

The CONTRACTOR shall warrant all furnished materials and equipment for a period of one year from date of final acceptance of the Work by the OWNER. This warranty shall mean prompt attention to the correction and/or complete replacement of the faulty material or equipment. The expiration of the one-year warranty period shall not affect any other claims or remedy available to the OWNER. There may be other warranty provisions in these contract documents in addition to those noted above.

1.28 UTILITY PROPERTIES AND SERVICE

In areas where the CONTRACTOR's operations are adjacent to or near a utility and such operations may cause damage which might result in significant expense, loss and inconvenience, the operations shall be suspended until all arrangements necessary for the protection thereof have been made by the CONTRACTOR.

The CONTRACTOR shall notify all utility offices which may be affected by the construction operation at least 48 hours in advance. Before exposing any utility, the utility having jurisdiction shall grant permission and may oversee the operation. Should service of any utility be interrupted due to the CONTRACTOR's operation, the proper authority shall be notified immediately. It is of the utmost importance that the CONTRACTOR cooperates with the said authority in restoring the service as promptly as possible. Any costs shall be borne by the CONTRACTOR.

Utilities which may be impacted include the following:

City of Roseburg	Water & Storm Sewer
Avista	Natural Gas
Roseburg Urban Sanitary Authority (RUSA)	Sanitary Sewer
Pacific Power	Power
Charter Communications	Cable
CenturyLink	Telephone
Sprint/Nextel	Fiber Optic Cable

1.29 SANITARY FACILITIES

The CONTRACTOR shall provide and maintain sanitary facilities for its employees and its

subcontractors' employees that will comply with the regulations of the local and State Departments of Health and as directed by the ENGINEER.

1.30 STREET CLEANUP

The CONTRACTOR shall clean daily all dirt, gravel, construction debris and other foreign material resulting from its operations from all streets and roads.

1.31 VEHICLE PARKING

The vehicles of the CONTRACTOR's and subcontractors' employees shall be parked in accordance with local parking ordinances.

1.32 PROTECTION OF QUALITY OF WATER

The work to be performed may involve connections to an existing potable water system. If such work is included in the project, the CONTRACTOR shall take such precautions as are necessary or as may be required to prevent the contamination of the water. Such contamination may include but shall not be limited to deleterious chemicals such as fuel, cleaning agents, paint, demolition and construction debris, sandblasting residue, etc. In the event contamination does occur, the CONTRACTOR shall, at its own expense, perform such work as may be necessary to repair any damage or to clean the affected areas of the water mains to a condition satisfactory to the ENGINEER.

1.33 RECORD DRAWINGS

CONTRACTOR shall maintain at the site one set of specifications, full size drawings, shop drawings, equipment drawings and supplemental drawings which shall be corrected as the work progresses to show all changes made. Drawings shall be available for inspection by the ENGINEER. Upon completion of the contract and prior to final payment, specifications and drawings shall be turned over to the ENGINEER.

1.34 "OR EQUAL" CLAUSE

In order to establish a basis of quality, certain processes, types of machinery and equipment or kinds of material may be specified on the drawings or herein by designating a manufacturer's name and referring to its brand or product designation. It is not the intent of these specifications to exclude other processes, equipment or materials of a type and quality equal to those designated. When a manufacturer's name, brand or item designation is given, it shall be understood that the words "or equal" follow such name or designation, whether in fact they do so or not. If the CONTRACTOR desires to furnish items of equipment by manufacturers other than those specified, he shall secure the approval of the ENGINEER prior to placing a purchase order.

No extras will be allowed the CONTRACTOR for any changes required to adopt the substitute equipment. Therefore, the CONTRACTOR's proposal for an alternate shall include all costs

for any modifications to the drawings, such as structural and foundation changes, additional piping or changes in piping, electrical changes or any other modifications which may be necessary or required for approval and adoption of the proposed alternate equipment. Approval of alternate equipment by the ENGINEER before or after bidding does not guarantee or imply that the alternate equipment will fit the design without modifications.

1.35 SURVEYS

Based upon the information provided by the Contract Documents, the CONTRACTOR shall develop and make all detail surveys necessary for layout and construction, including exact component location, working points, lines and elevations. Prior to construction, the field layout shall be approved by the OWNER's representative. The CONTRACTOR shall have the responsibility to carefully preserve bench marks, reference points and stakes, and in the case of destruction thereof by the CONTRACTOR or resulting from its negligence, the CONTRACTOR shall be charged with the expense and damage resulting therefore and shall be responsible for any mistakes that may be caused by the unnecessary loss or disturbance of such bench marks, reference points and stakes.

1.36 WORK HOUR LIMITATIONS

All work shall be conducted between the hours of 7:00 a.m. and 6:00 p.m. on non-holiday weekdays only. No weekend work will be allowed. Requests for variations in work hours shall be made in writing for consideration by the ENGINEER. No work shall be conducted outside of the above-described days and hours without prior approval of the ENGINEER.

1.37 DUST PREVENTION

All unpaved streets, roads, detours, haul roads or other areas where dust may be generated shall receive an approved dust-preventive treatment or be routinely watered to prevent dust. Applicable environmental regulations for dust prevention shall be strictly enforced.

1.38 EROSION AND SEDIMENTATION CONTROL

The OWNER has obtained a National Pollutant Discharge Elimination system (NPDES) 1200-C Permit for this project. The CONTRACTOR shall take the necessary steps and pay the required fees to transfer the Permit from the OWNER to the CONTRACTOR (DEQ Form 08-WQ-013). The CONTRACTOR shall be responsible for compliance with all 1200-C permit provisions.

Temporary construction site erosion control measures shall be designed and constructed in accordance with the 1200-C, project drawings and specifications, and the requirement of the City of Roseburg, and the Oregon Department of Environmental Quality.

Erosion control measures shall be maintained throughout the project site until approved permanent cover such as a healthy stand of grass, other permanent vegetation, or other ground covering is established. When approved permanent ground cover is established, all

temporary erosion control measures shall be removed from the construction site. Erosion control measures shall be installed as approved, per the erosion control drawing(s) in the above referenced document. Erosion control measures including stabilized construction entrances and sediment barriers must be established in conjunction with site clearing and grading.

During construction, and until permanent vegetation or other ground covering is established, the erosion control facilities shall be upgraded as needed for unexpected storm events or site conditions and with the purpose of retaining sediment and sediment-laden water on the construction site.

1.39 INTERFERENCES, OBSTRUCTIONS AND SEWER CROSSINGS

At certain places, power, light and telephone poles may interfere with excavation and the operation of the CONTRACTOR's equipment. Necessary arrangements shall be made with utility companies for moving or maintaining such poles. The utility company affected by any such interferences shall be notified thereof so that the necessary moving or proper care of poles and appurtenances may have appropriate attention.

All costs resulting from any other interferences and obstructions, or the replacement of such, whether or not herein specifically mentioned, shall be included and absorbed in the unit prices of the CONTRACTOR's bid.

1.40 NOISE LIMITATIONS

The project areas are located within a residential zoned area. All applicable City, County ordinances and State and Federal regulations shall be complied with.

1.41 STORAGE AND PROTECTION OF EQUIPMENT AND MATERIALS

A. Materials and equipment stored overnight shall be placed neatly on the job site. Unusable materials (i.e. rejected or damaged liner material, old concrete chunks, metal scraps, etc.) shall be expeditiously removed from the job site.

   Provide appropriate barricades, signs, and traffic control devices in like-new condition where necessary to protect the public from any hazards associated with the storage of materials and equipment used for this project.

B. No equipment and/or materials shall be stored outside the immediate work area on public right-of-ways, in the following locations, or in the following manner:

   1. In any maintained landscaped or lawn area.

   2. In a manner that would totally eliminate an individual residents' street parking.

   3. In front of any business.

The “immediate work area” is the area where work is taking place or will be taking place within one calendar day. The CONTRACTOR shall immediately move stored material or equipment which causes a nuisance or creates complaints.

1.42 COMPETENT PERSON DESIGNATION

CONTRACTOR shall designate a qualified and experienced “competent person” at the site whose duties and responsibilities shall include enforcement of Oregon - OSHA regulations regarding excavations, the prevention of accidents, and the maintenance and supervision of construction site safety precautions and programs.

1.43 EMERGENCY MAINTENANCE SUPERVISOR

The CONTRACTOR shall submit to the ENGINEER the names, addresses and telephone numbers of at least two employees responsible for performing emergency maintenance and repairs when the CONTRACTOR is not working. These employees shall be designated, in writing by the CONTRACTOR, to act as its representatives and shall have full authority to act on its behalf. At least one of the designated employees shall be available for a telephone call any time an emergency arises.

1.44 PREVAILING WAGE RATES FOR PUBLIC WORKS CONTRACTS IN OREGON

The CONTRACTOR shall abide by ORS 279C.800 through 279C.870 which relate to the prevailing wage rates for the building and construction trades in the State of Oregon. These prevailing wage rates are shown in the Bureau of Labor and Industries document which is included elsewhere in these contract documents.

1.45 OREGON PRODUCTS

CONTRACTOR's attention is directed to the provisions of Oregon Law, ORS 279A.120 regarding the preference for products that have been manufactured or produced in Oregon. CONTRACTOR shall use Oregon-produced or manufactured materials with respect to common building materials such as cement, sand, crushed rock, gravel, plaster, etc., and Oregon-manufactured products in all cases where price, fitness, availability and quality are otherwise equal.

1.46 USE OF EXPLOSIVES

The use of explosives shall not be allowed on this project. Alternative methods of excavation shall be utilized.

1.47 CONTAMINATED MATERIAL

A. General

It is possible that the CONTRACTOR may encounter contaminated material (soil and/or

water) during excavation activities. This specification identifies requirements for handling and disposing contaminated media.

B. Definitions

1. "Contaminated material" is defined as soil, water, free product, Underground Storage Tanks (UST), buried abandoned utility lines containing residual or free product, solid waste, treated wood waste, chemical containers, or other solid, liquid, or gas substances with contamination levels above background levels.

2. "Hazardous substances" shall mean those substances or materials defined in the Oregon Revised Statutes (ORS) 465.200, as amended.

3. "Release" shall have the meaning as defined in ORS 465.200, as amended.

4. "Environmental laws" shall mean any applicable statute, law, ordinance, order, consent decree, judgment, permit, license, code, covenant, deed, common law, treaty, convention or other requirement pertaining to protection of the environment, health or safety, natural resources, conservation, wildlife, waste management or disposal, hazardous substances or pollution, including but not limited to regulation of releases to air, land, water, and groundwater.

C. Execution

1. Discovery of Contaminated Material

In the event that the CONTRACTOR, during the course of construction or during any other activities authorized under this contract, should encounter suspected contaminated material or any other materials suspected of posing a threat to human health and the environment, the CONTRACTOR shall notify the ENGINEER immediately and manage according to requirements identified below.

2. Discovery of Contaminated Soil

CONTRACTOR shall note evidence of contamination (odor, visual staining of soil, free liquid product seeping from soil, sheen on groundwater etc.) and note location of evidence on a sketch of the excavation and provide to the ENGINEER.

CONTRACTOR shall report the discovery to the ENGINEER immediately. CONTRACTOR shall stop all excavation activities, and secure the site to prevent entry by the public. The excavation shall not be backfilled. Protect all open excavations with berms, plates and fencing. CONTRACTOR may continue with work in other non-contaminated areas.

CONTRACTOR shall assist ENGINEER in collecting sample(s) of suspected contaminated media for testing and characterization. CONTRACTOR shall allow 21

days, at no cost to OWNER, for testing, results and instructions as to how to proceed with contaminated materials.

The CONTRACTOR shall obtain a copy of an approved soil disposal/acceptance permit (Disposal/Treatment Facility requires transporter to have a copy of the permit.)

CONTRACTOR will transport and dispose of contaminated material at an approved disposal/treatment facility.

CONTRACTOR shall provide the ENGINEER with a copy of the contaminated soil disposal receipt.

3. Handling of Contaminated Soil

After approval from the ENGINEER, excavate the soil in a manner that prevents commingling of contaminated and non-contaminated soil. ENGINEER will make determination (based on soil saturation) if contaminated soil can be directly transported to a treatment or disposal facility, or if soil needs to be stockpiled to reduce water content. ENGINEER will determine when stockpiled soil can be transported off-site.

CONTRACTOR will be responsible for stockpiling contaminated soil in containers or on impervious surface to prevent the spread of contamination. Any water runoff from the contaminated soil stockpile area(s) must be contained by CONTRACTOR and handled as contaminated water.

Minimize movement of excavation equipment over or through contaminated soil to prevent movement of contaminated soil into areas where no contaminated soil exists.

Stockpiles will be created on an approved site and shall be surrounded by a fence to limit access. The stockpiles must be covered and bermed during periods of rainfall to prevent run-on and run-off. The stockpiles shall be covered with a minimum 10 mil high density polyethylene (HDPE) plastic during periods of strong winds, nightfall, over the weekends, or during extended work stoppages. If dust is observed coming from the stockpiles, the stockpiles shall be either covered or the dust controlled with water.

Maintain excavation equipment in good working order. Prevent spillage of oil, fuel, or hazardous substances from equipment. In particular, promptly repair oil leaks from equipment and clean up any contaminated soil.

4. Transport of Contaminated Materials

CONTRACTOR shall comply with all applicable Federal, State, or local laws, codes,

and ordinances that govern or regulate contaminated substance transportation. Contaminated soils placed in stockpiles shall be loaded into trucks in a manner that prevents the spilling or tracking of contaminated soil into areas of the site with uncontaminated soil. Loose material falling onto the exterior of the truck during loading shall be removed before the truck leaves the loading area. Any material collected in the loading area shall either be placed back into the truck or back into the stockpile. If loading areas are unpaved, the surface soil shall be sampled at the conclusion of the loading activities to confirm that contaminated soil is not present. If loading areas are paved, any loose soil shall be cleaned from the pavement at the conclusion of the loading activities.

Specific truck haul routes shall be established before beginning off-site contaminated media transport. On-site truck routes shall be established to minimize or prevent movement of trucks over contaminated soils. Off-site truck routes shall be established to reduce the risk of releases of contaminated soils and impact on local traffic. The CONTRACTOR shall be responsible for ensuring that loaded truck weights are within acceptable limits. All trucks shall be covered before they leave the loading area.

The CONTRACTOR shall ensure that all drivers of vehicles transporting contaminated substances have in their possession during transport all applicable Oregon State and local vehicle insurance requirements, valid driver's license, and vehicle registration and license. The CONTRACTOR shall be responsible for informing all drivers of transport vehicle about:

a. The nature of the material transported.

b. Required routes to and from the off-site thermal treatment or disposal facility.

c. Applicable County street regulations and requirements, and State of Oregon Department of Transportation codes, regulations and requirements.

d. The County's requirement for proper handling and transportation of the substances.

The CONTRACTOR shall not allow contaminated substances to be spilled or tracked off-site at any time during the project. Trucks used for the transportation of contaminated substances off-site shall be water tight, substance compatible, licensed, insured, and permitted pursuant to federal, state, and local statutes, rules, regulations and ordinances.

If contaminated media is discarded prior to removal of contaminated material, the price per cubic yard of soil materials and price per 100 gallons of contaminated water will be negotiated with OWNER.

1.48 SEQUENCE OF CONSTRUCTION REQUIREMENTS

See Specification Section 01 12 16, *Work Sequence and Schedule Constraints*.

1.49 CONSTRUCTION WITHIN STATE WATERS

The OWNER has obtained the necessary permits for work within jurisdictional wetland waters of the state. The Oregon Division of State Lands has issued a permit which is included herein under Supplemental Information section of these specifications. The CONTRACTOR shall abide by all regulations and conditions stipulated in the permits and such conditions and requirements are hereby made a part of these specifications.

1.50 PROJECT INFORMATION SIGNS – NOT USED

1.51 INADVERTENT DISCOVERY PLAN FOR CULTURAL RESOURCES

The CONTRACTOR shall follow this Inadvertent Discovery Plan (IDP) if cultural material including human remains are encountered during construction. In addition to the requirements below, the CONTRACTOR shall comply in all respects to the requirements of Section 00290.50, Protection of Cultural Resources and Section 00290.51, Protection of Sensitive Cultural Sites, Oregon Standard Specifications for Construction, Oregon Department of Transportation (ODOT).

The IDP for the project is as follows:

Protocol for Coordination in the Event of Inadvertent Discovery

A. In the event of an inadvertent discovery of possible archaeological materials, all work will stop immediately in the vicinity of the find.

B. The area will be secured and protected.

C. The City's Archaeologist or the Resident Project Representative (RPR) will be notified. The RPR will notify the appropriate authorities which shall be Rural Development, USDA State Environmental Coordinator (SEC) and the State Historic Preservation Office (SHPO). If possible human remains are encountered, the RD SEC and the Lane County Coroner will be notified immediately. The RD SEC will then notify the SHPO and the appropriate Tribes. Contact names and numbers are as follows:

Rural Development, USDA: Charlotte Rollier, State Environmental Coordinator (RD SEC) – 503-414-3356

State Historic Preservation Office: Dennis Griffin, Archeologist – 503-986-0674

D. No work may resume until the City's Archeologist is on site and able to assess the situation.

E. If human remains are encountered, do not disturb them in any way. *Do not call 911*. Do not speak with the media. Secure the location. Do not take photos.

F. The City's Archeologist will consult with the RD SEC and SHPO, who will then contact the appropriate Tribal Governments and determine an appropriate course of action.

G. Additional archeological excavations may be required. This work will be handled on a case by case basis by the City's Archaeologist in consultation with the RD SEC and SHPO and appropriate Tribes.

When to Stop Work

Construction work may uncover previously unidentified Native American or Euro-American artifacts. This may occur for a variety of reasons, but may be associated with access restrictions during project development, or if the area contains impervious surfaces throughout most of the project area which would have prevented standard archaeological site discovery methods.

A. Work must stop when the following types of artifacts and/or features are encountered:

1. Native American artifacts may include (but are not limited to):

- Flaked stone tools (arrowheads, knives scrapers etc.)
- Waste flakes that resulted from the construction of flaked stone tools.
- Ground stone tools like mortars and pestles.
- Layers (strata) of discolored earth resulting from fire hearths. May be black, red or mottled brown and often contain discolored cracked rocks or dark soil with broken shell
- Human remains
- Structural remains- wooden beams, post holes, fish weirs

2. Euro-American artifacts my include (but are not limited to):

- Glass (from bottles, vessels, windows etc.)
- Ceramic (from dinnerware, vessels etc.)
- Metal (nails, drink/food cans, tobacco tins, industrial parts etc.)
- Building materials (bricks, shingles etc.)
- Building remains (foundations, architectural components etc.)
- Old wooden posts, pilings, or planks (these may be encountered above or below water)
- Even what looks to be old garbage could very well be an important archaeological resource
- Remains of ships or sea-going vessels, marine hardware etc.
- Old farm equipment may indicate historic resources in the area

END OF SECTION

SECTION 01 12 16

WORK SEQUENCE AND SCHEDULE CONSTRAINTS

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes general sequencing, project phasing and coordination requirements for the Work.

1.2 RELATED SECTIONS

Section/Division No.	Item
01 10 00	Summary of Work

1.3 GENERAL CONSTRAINTS ON SEQUENCE AND SCHEDULING OF WORK

A. Coordinate construction schedule and operation with OWNER and ENGINEER.

B. Coordinate proposed work with OWNER and ENGINEER before implementing shutdowns of any water system facilities associated with the Project. Under no circumstances shall work cease at the end of a normal working day if such actions may inadvertently cause a cessation of any facility operating process; in which case, CONTRACTOR shall remain on site until necessary repairs are complete and full water system function is restored.

C. Do not close lines, open valves, or take other action that would affect the operation of existing systems, except as specifically required by the Contract Documents and after approval of OWNER and ENGINEER.

D. CONTRACTOR shall not operate any of the existing equipment or facilities without written permission from the OWNER naming the specific piece of equipment and dates the CONTRACTOR may use the equipment or facilities. The CONTRACTOR is liable for any loss or damage caused to property or equipment or facilities or any personal injury resulting from or related to this usage.

1.4 SUBMITTALS

A. Submit a Work Sequencing Plan detailing the complete sequence of construction for all activities contained herein.

B. Identify the following in the Work Sequencing Plan:

1. Major work activities to occur.

2. General schedule when work will occur. Submit separately a detailed schedule as specified in Section 01 33 00, Submittal Procedures. Incorporate materials in detailed schedule and work sequencing plan.

3. What assistance will be required of OWNER's operating personnel during shutdown and for start-up.

4. Contingency backup plan identifying what action will be taken if activities during a shutdown cannot be completed within the allotted times, or if there is a failure of the CONTRACTOR's temporary equipment.

5. Name of individual in charge of CONTRACTOR's activity during shutdown.

1.5 SHUTDOWN OF WATER TRANSMISSION MAIN

A. Submit requests for shutdown of water transmission main not less than ten (10) business days in advance of the date scheduled for the interruption.

B. Following receipt of the request, ENGINEER will notify the CONTRACTOR if the requested date will be permitted. Evaluation of the request will be based upon the availability of the utility owner's personnel to assist and monitor utilities during the shutdown period and impact to customer service.

C. Minimize the period of interruption by thorough advance planning. Procure required materials, equipment and labor and have on hand during the shutdown.

D. Do not begin interruption until written authorization is received from ENGINEER.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS FOR EXECUTION OF WORK

A. Maintain overall coordination of execution of Work.

B. Obtain all necessary permits for the work.

C. Obtain schedules from subcontractors and suppliers and assume responsibility for correctness.

D. Incorporate schedules from all parties into Progress Schedule to plan for and comply with sequencing constraints.

E. Contractor shall pothole all crossing utilities and confirm all connections for water pipe Alignments A and B prior to beginning pipe installation work for that respective pipeline.

F. Contractor shall install all erosion control measures in place as required prior to beginning work.

G. Required shutdowns of City operated transmission mains, and allowable durations for each shutdown event are included below in bold in subsection 3.2. Shutdown durations listed shall include time for City staff to close the necessary valves and drain the line as much as possible through existing blow-offs or fire hydrants, and then refilling and placing existing transmission main back into service after the Contractor's work has been completed.

H. Contractor shall install new water pipelines (Alignments A and B) short of tie-in connections to complete hydrostatic testing and disinfection prior to beginning tie-ins to existing water system. See Section 33 13 00 – Testing and Disinfection of Water Utility Piping.

3.2 SEQUENCE OF CONSTRUCTION REQUIREMENTS AND CONSTRAINTS

A. Alignment A Work – Shutdown of existing 30-inch water main to perform tie-in at STA A1+00 Alignment A shall not commence until after 24-inch Intertie (Alignment B) pipeline has been tested and disinfected, tied into existing water system, and placed into service. All other Alignment A pipeline installation work may be undertaken prior and as described herein:

1. Contractor shall pothole all crossing utilities and confirm all connections to existing water system prior to beginning Alignment A pipe installation work.

2. Contractor shall excavate up to four (4) exploratory test pits between STA A6+40 and A8+00 with Project Geotechnical Engineer present to confirm existing subsurface conditions on fill slopes. Contractor shall provide notification of proposed date(s) to perform test pit excavations to the Owner and Engineer a minimum of two (2) weeks prior to date of work to allow coordination time to schedule work with Geotechnical Engineer. Contractor shall allow a minimum review time of three (3) business days after subsurface conditions have been confirmed via test pits before scheduling pipe installation on the fill slope to allow for possible modifications to the design shown on Sheet C-3. Any changes to the design require approval by Engineer.

3. Prior to excavating behind existing 24-inch steel pipeline bend (24-inch water main installation work between approximate STA A6+90 to STA A7+20), Contractor shall coordinate with City staff to shutdown and drain/depressurize existing transmission main as required during this planned work. After new 24-inch piping

has been installed behind the bend, Contractor shall backfill trench with crushed rock and compact per the specification prior to the existing transmission main being re-pressurized and placed back into service. Contractor shall provide notification to Owner in advance of scheduling work and **shutdown of existing 24-inch transmission main on the slope shall be limited to 48-hours maximum**.

4. Alignment A work and any grading work, and surface restoration and grass reseeding work in unimproved native areas shall be completed prior to September 1st, 2020, unless otherwise allowed by Engineer.

5. **Shutdown of existing 30-inch water transmission main to complete tie-in connection at STA A1+00 shall be limited to one work shift (approximately 8 hours or less).**

B. Alignment B Work - 24-inch Intertie (Alignment B) work shall be completed prior to shutdown of existing 30-inch water main to perform tie-in at STA A1+00 for Alignment A, as described above for Alignment A Work.

1. Contractor shall pothole all crossing utilities and confirm connections to existing water system prior to beginning Alignment B pipe installation work, including confirming OD of existing 24-inch steel pipeline at STA B1+55 for ordering insulated flexible coupling.

2. Contractor shall install gravity thrust block at STA B1+44, with cure time as required to obtain 90% of the specified compressive strength of the concrete, prior to completing connection to existing water main at B1+55, and placing existing 24-inch transmission main back in service. Contractor to coordinate with City staff to turn existing valving as required.

3. Contractor to prepare existing pipe surfaces and repair coating and lining of cut end of 24-inch steel pipe as shown on Drawings prior to completing final connection to existing main with insulated coupling. Plate and cover pit for final connection as required to allow recommended curing time for pipe repair coating per coating manufacturer's direction. Wax tape coupled connection prior to backfilling pit per Drawings.

4. 24-inch Intertie work shall require shutdown and draining of the existing 24-inch ductile iron transmission main located within Walnut Street for completing cut-in connection as shown on Plans at STA B1+00. Contractor shall perform this tie-in only after new piping and concrete anchor wall at STA B1+12 has been installed and concrete allowed to cure to obtain 90% of its specified compressive strength. **Shutdown of existing 24-inch ductile iron water transmission main in Walnut Street for cut-in connection shall be limited to one work shift (8 hours or less).**

END OF SECTION

SECTION 01 22 20

UNIT PRICE MEASUREMENT AND PAYMENT

PART 1 GENERAL

Measurement and payment will be on a unit price basis in accordance with the prices set forth in the proposal for individual work items. Where work is required but does not appear as a separate item in the proposal, the cost for that work shall be included and absorbed in the unit prices named in the proposal. CONTRACTOR shall make a careful assessment when preparing the bid.

1. Mobilization, Bonds, Insurance and Demobilization: Payment for mobilization, bonds, insurance and demobilization will be on a lump sum basis. The amounts paid for mobilization in the contract progress payment will be based on the percent of the original contract amount that is earned from other contract items, as follows:

   A. When 5% is earned, either 100% of the amount for mobilization or 5% of the original contract amount, whichever is the least;

   B. When all work is completed, amount of mobilization exceeding 5% of the original contract amount

   This schedule of mobilization progress payments will not limit or preclude progress payments otherwise provided by the contract.

2. Site Clearing and Erosion Control: Payment for clearing and preparing site for construction operations including; removing existing trees and vegetation, clearing and grubbing the surface within the work limits, and installation of approved erosion control devices (sediment barrier, inlet protection, check dams, slope matting, construction entrance, and other items), all as shown on Drawings and as required, including all labor, materials, and equipment, as required, will be on a lump sum basis.

   This lump sum bid item shall also include the Contractor's acceptance and execution of the project's 1200C permit and erosion control plan, respectively, including required inspection and maintenance of erosion control devices, repair and/or replacement, and removal of temporary erosion control devices after construction and establishment of permanent erosion control features, as may be required and per the project Drawings. Any work relating to erosion control measures required to maintain compliance with local regulations and the 1200C shall be considered incidental to this bid item.

3. Traffic Control: Payment for providing traffic control, maintenance and protection including all coordination, materials, labor and equipment, as required, will be on a lump sum basis, complete, and shall also include all work required to develop a traffic control/street closure plan and submit for approval per the Specifications.

4. Potholing for Utilities: Payment for potholing existing buried utilities including all labor, equipment, and materials necessary to locate existing utilities at all proposed water main crossings shall be on a lump sum basis, complete. All known utilities crossing the proposed pipeline alignment shall be potholed and depth verified by the Contractor prior to beginning excavation for water main installations. Potholing for those utilities not specifically called out on the Drawings shall be incidental to other bid items listed herein. The payment for the work under this item includes utility locate notifications, the excavation and disposal of waste material, furnishing and installing granular backfill and its compaction, including temporary roadway patching and surface restoration as required. Utility potholing shall be approved by Owner prior to beginning potholing and compiled pothole data shall be provided by the Contractor to the Owner after all known utilities have been located to review.

5. Sod and Topsoil Removal and Replacement within Delineated Wetlands Areas: Payment for sod and topsoil removal and replacement within delineated wetland areas per limits shown on Sheets C-3 and C-4 will be made on a lump sum basis. The lump sum price shall include cutting of sod with sod harvesting equipment, stockpiling of sod beside the pipeline trenches, excavation of the topsoil and stockpiling of the topsoil beside the trench separate from the sod, protection of existing wetlands with geotextile material beneath stockpiles, and replacement of the topsoil and sod to match existing landscape and contours.

6. Furnish and Install Restrained 24-inch Class 52 Ductile Iron Pipe with Class B Trench Backfill: Payment for furnishing and installing Class 52 ductile iron (DI) pipe with Class B trench backfill, including all work and materials, excavation to depth shown on Drawings, all required joint restraint systems for pipe, fittings, valves, and appurtenances, standard non-reinforced concrete thrust blocks (including concrete, excavation, and thrust plates), dewatering, Class B bedding, Class B pipe zone and Class B trench backfill and temporary asphaltic concrete surfacing where required will be on a per linear foot basis. Measurement will be based on total length of piping constructed with restrained joints without deduction for fittings and valves. Bedding, pipe zone and trench backfill material is understood to be imported granular material, compacted in place as shown on the Drawings. Class B fill material shall be as specified within Section 31 23 17, Trenching.

   Bid item quantity shall also include restrained joint Class 52 ductile iron (DI) piping to be installed in fill slope from approximate STA A6+40 to STA A7+10 and STA A7+30 and A8+20 and backfilled with compacted coarse aggregate structural trench backfill to within 18-inches of existing surface grade and select native and topsoil for the remainder as shown on the Drawings. Contractor may elect to backfill and compact trench above pipe zone with dense graded 1 ½”-0 in lieu of Class B backfill.

   The pay quantities for pipe, trench excavation and backfill will be on the basis of the horizontal length of pipe laid without deductions for valves or fittings which may be included in the end-to-end measurement of a continuous section of pipe. Where pipe is laid on a continuous slope greater than 10 percent for a distance greater than 100 feet, payment will

be made upon the average slope distance between 100-foot stations. When water mains intersect, the measurement of each main shall be to the intersection of the center lines of the connecting fittings.

The unit price shall include any incidental excavation, backfill and additional work required to cut existing piping, and installation of branch-line fittings. Unit price shall also include as incidental the removal of existing fittings, piping and concrete collar thrust blocks as shown on the Drawings, except where existing abandoned piping to be removed includes coatings requiring asbestos abatement. Removal of this abandoned piping will be paid for under a separate bid item.

7. Furnish and Install Restrained 24-inch Class 52 Ductile Iron Pipe with Class A Trench Backfill: Payment for furnishing and installing Class 52 ductile iron (DI) pipe with Class A trench backfill, including all work and materials, excavation to depth shown on the Drawings, all required joint restraint systems for pipe, fittings, valves, and appurtenances, standard concrete thrust blocks (including concrete, excavation, and thrust plates), dewatering, Class B bedding and pipe zone backfill and Class A trench backfill will be on a per linear foot basis. Measurement will be based on total length of piping constructed with restrained joints as indicated on the Drawings without deduction for fittings and valves. Bedding and pipe zone material is understood to be imported granular material, compacted in place as shown on the Drawings. Trench backfill material is understood to be select native material, compacted in place as shown. Class A fill material shall be as specified within Section 31 23 17, Trenching.

   The pay quantities for pipe, trench excavation and backfill will be on the same basis and shall include the same work as specified in Pay Item 6.

8. Furnish and Install Restrained Cast or Ductile Iron Fittings (36-inch, 30-inch, and 24-inch; 8a – 8g): Payment for furnishing and installing cast or ductile iron fittings will be made on a per each basis for the nominal size of the respective fitting installed per the bid schedule. Fitting installation will be considered a separate pay item from work performed under other pay items. Work included under this bid item shall include all labor, materials, and equipment required to furnish and install AWWA C110 or C153 cast or ductile iron fittings with the joint types shown on the Drawings, including joint restraints, wax tape coating, polyethylene encasement, bolts and nuts and other fitting hardware, gaskets, thrust blocks where noted, tracer wire, marking tape, and any other material required to install fittings in accordance with the Specifications. AWWA C115 ductile iron flange by plain end spools will not be paid for under this bid item and will be paid for under their applicable per linear foot ductile iron piping bid item as described above. DI fittings installed on a temporary basis to facilitate testing and disinfection of new water mains to be paid for under other bid items.

9. Furnish and Install Concrete Slope Anchor Blocks: Payment for furnishing and installing concrete slope anchors on 24-inch pipe on slope will be on a per each basis. The unit price for this bid item shall include all labor, equipment, and materials required to construct concrete anchor blocks as shown on the Drawings. All accessories including concrete, rebar,

midspan mechanical joint restraint and steel bearing plate, and all other materials required to construct the slope anchor shall be considered incidental to this bid item.

10. Furnish and Install Trench Check Dams: Payment for furnishing and installing trench check dams on 24-inch pipe will be on a per each basis. The unit price for this bid item shall include all labor, equipment, and materials required to construct complete trench check dams as shown on the Drawings.

11. Furnish and Install Concrete Anchor Walls: Payment for furnishing and installing concrete anchor walls on 24-inch pipe will be on a per each basis. The per each price for this bid item shall include all labor, equipment, and materials required to construct concrete anchor wall as and where shown on the Drawings. All accessories including concrete, rebar, joint, mechanical joint restraint and steel bearing plate, and all other materials required to construct the anchor wall shall be considered incidental to this bid item.

12. Furnish and Install Gravity Thrust Block: Payment for furnishing and installing concrete gravity thrust blocks on 24-inch pipe vertical bends where shown will be on a per each basis. The per each price for this bid item shall include all labor, equipment, and materials required to construct concrete gravity thrust block as and where shown on the Drawings. All accessories including concrete, rebar, turnbuckles, wax tape coating, and all other materials required to construct the gravity thrust block shall be considered incidental to this bid item.

13. Furnish and Install Buried 24-inch Butterfly Valves: Payment for furnishing and installing buried butterfly valves including valve boxes, covers, risers, operator extensions (where required), wax tape coating and polyethylene encasement, complete, will be on a per each valve basis. All accessories including gaskets, restraint glands, hardware, and all other materials required to install a functional butterfly valve shall be considered incidental to this bid item.

14. Air Release Valve Assemblies (2-inch): Payment for furnishing and installing 2-inch air release valve assemblies for ductile iron pipe including excavation, Class B bedding and backfill, PVC tape wrap, and any other items as shown on the Drawings and as specified will be on a per each assembly basis, complete.

15. Air Release Valve Assemblies (6-inch): Payment for furnishing and installing 6-inch air release valve assemblies for ductile iron pipe including excavation, Class B bedding and backfill, 6-inch piping and fittings, wax tape coating for buried fittings and valves, polyethylene encasement, precast concrete manhole, air valve vent piping, and any other items as shown on the Drawings and as specified will be on a per each assembly basis, complete. The 24-inch x 6-inch mainline tee fitting shall be paid for under a separate bid item.

16. 6-inch Blow-Off Assemblies: Payment for furnishing and installing 6-inch blowoff assemblies for ductile iron pipe including excavation, Class B bedding and backfill, 6-inch piping and fittings, wax tape coating for buried fittings and valves, polyethylene encasement, and any other items as shown on the Drawings and as specified will be on a per each assembly basis,

complete. The 24-inch x 6-inch mainline tee fitting shall be paid for under a separate bid item.

17. Connections to Existing Water System Facilities, Alignment A: Payment for labor and equipment not previously included under other bid items to install connections to existing water system facilities shall be on a lump sum basis for pipeline Alignment A, complete. Bid item shall also include exploratory excavation work required to confirm existing piping connections' configuration and requirements, work to properly drain existing piping and dispose of water (where required),and performing swab and/or spray disinfection of connection piping per AWWA C651, all per the requirement of the Specifications. Ductile iron piping and fittings to complete connections to be paid for under their applicable bid items.

18. Connections to Existing Water System Facilities, Alignment B: Payment for labor and equipment not previously included under other bid items to install connections to existing water system facilities shall be on a lump sum basis for pipeline Alignment B, complete. Bid item shall also include exploratory excavation work required to confirm existing piping connections' configuration and requirements including confirming pipe OD prior to ordering fabricated coupling, work to properly drain existing piping and dispose of water (where required), preparing and repairing coating and lining of cut end of steel pipe, and performing swab and/or spray disinfection of connection piping per AWWA C651, all per the requirement of the Specifications. Ductile iron piping and fittings to complete connections to be paid for under their applicable bid items, except for 24-inch insulated flexible reducing coupling and wax tape coating, which is to be paid for as part of this lump sum bid item.

19. Test Pit Excavations on Fill Slope: Payment excavating test pits on fill slope between STA 6+40 to STA A8+00 will be made on a per each basis. Test pits are to be approximately spaced evenly along the new 24-inch water main's alignment within the fill slope section, as approved by Engineer, and shall extend to a depth of 15-feet or to top of subsurface bedrock, whichever is shallower. The unit price for this bid item shall include all labor, equipment, and materials, including shoring, required to excavate existing fill and undisturbed native materials to confirm depth to subsurface bedrock, while maintaining slope stability throughout and afterwards. If required excavation depth to confirm bedrock elevation is over 15-feet, additional depth of excavation will be paid for per cubic yard of additional excavated volume per Bid Item No. 20, Additional Cost for Overdepth Excavation.

20. Additional Cost for Overdepth Excavation: Payment for overdepth excavation will be made at the unit price per cubic yard of excavated fill or native material required in addition to the work paid for per other bid items in order to satisfy depth requirements exceeding those shown on the Drawings or specified elsewhere. Contractor shall review with City's inspector the need for overdepth excavation and obtain approval for work prior to proceeding or risk receiving no additional pay for such work.

    The unit price for this bid item shall include all labor, equipment, and materials, including shoring, required to excavate additional existing fill and undisturbed native materials as

described above. Unit price shall also include additional backfill materials and compaction labor required per the Drawings to restore excavations to preconstruction grades.

Overdepth excavation shall not include any rock removal quantities which shall be paid for under its specific bid item.

21. Additional Cost for Rock Removal: Payment for rock removal will be made at the unit price per cubic yard of rock removal and rock removal will be paid for in addition to the lineal foot price for pipe, trench excavation and backfill. The pay limits for pipe trench shall be 12 inches below the pipe invert and the width shall be the nominal pipe diameter plus 1 foot on each side of the pipe. Pay limits for vault and other structures shall be to the depth necessary to install the structure and to a maximum of 18 inches beyond the outside walls of the vault or structure. No payment will be made for rock removal beyond these limits.

    Rock removal is defined in Section 31 23 18, Rock Removal.

    CONTRACTOR's attention is directed to Section 01 10 00, Summary of Work, which disallows CONTRACTOR's use of explosives.

22. Removal of Existing Abandoned 24-inch Piping and Asbestos Abatement on West Avenue: Payment for abandonment of existing abandoned 24-inch piping on where shown on Drawings (West Avenue) shall be on a lump sum basis. Work under this item shall include excavation (if not included with another bid item), cutting, removal and proper disposal of existing piping and appurtenances as required to facilitate installation of new 24-inch intertie. Bid item shall also include plugging the end of abandoned piping to remain buried with concrete or grout as required.

    It is assumed that coating of existing piping to be removed contains asbestos. Work to properly remove and dispose of existing piping with coatings containing asbestos includes but is not limited to; assessment of the site by an accredited asbestos surveyor, application for variances through DEQ, if required, permitting through DEQ, preparation of proper DEQ notification paperwork, removal of friable and non-friable forms of asbestos, all of which shall be considered incidental to this pay item. All work shall be performed by a licensed asbestos abatement Contractor or under the guidance of as allowed by DEQ, and all disposal shall be performed in accordance with DEQ and OSHA guidelines and Oregon Administrative Rules. It is anticipated that the asbestos encountered will likely become friable during abandoned pipeline excavation and removal.

23. Cutting and Replacing Existing Sanitary Sewer Laterals at Water Main Under-Crossings: Payment for cutting into existing sanitary sewer lateral and installing one full stick of pipe centered over new 24-inch water main alignment at water under-crossings to comply with OAR 333 or facilitate water main trench installation shall be paid for on a per each basis per approval of the Owner. Contractor shall review each proposed lateral cut with the City's inspector and RUSA (as needed) and obtain approval for work prior to proceeding. Work under this item shall include all excavation work not paid for under other bid items, cutting

and plugging existing lateral, any required sewage bypass pumping, removal and disposal of existing piping, installation of new sewer piping, couplings and appurtenances all as required to facilitate installation of replacement section of sanitary sewer lateral. All work shall be per the City and RUSA's standards, and per OAR 333.

24. Sanitary Sewer Lateral Relocations: Payment for relocating existing sanitary sewer laterals found to be in conflict with new 24-inch water watermain profile or OAR 333 during utility potholing shall be paid for per each completed on an as needed basis and per approval of the Owner. Contractor shall review each required lateral relocation with the City's inspector and RUSA (as needed) and obtain approval for work prior to proceeding. Work under this item shall include all excavation work not paid for under other bid items, cutting and plugging existing lateral, any required sewage bypass pumping, removal and disposal of existing piping, installation of new sewer piping, couplings and appurtenances as required to facilitate relocation of sanitary sewer lateral to comply with OAR 333. All work shall be per the City and RUSA's standards.

25. Testing, Flushing, and Disinfection of Water Mains: Payment for testing, flushing and disinfection of water mains will be on a lump sum basis. New water mains shall be hydrostatically tested, flushed, and properly disinfected separately from existing water facilities prior to completing final tie-in connections. Cost for furnishing, installing and removing temporary blowoff piping including miscellaneous piping, valves, fittings and thrust restraint shall be included in this lump sum. The OWNER shall provide off-site laboratory analysis for Bac-T samples. Payment for any retesting shall be paid by the CONTRACTOR. Disinfection of connection piping by swab and/or spray prior to tie-in shall be paid for under separate bid items.

26. Sawcut, Removal, and Disposal of Existing Asphaltic Concrete (AC), and Preparation of Base Aggregate: Measurement and payment for saw cutting, removal and disposal of existing AC roadway, and preparation of roadway base aggregate will be on a per square yard basis. Work under this item shall include all labor, materials, and equipment required to saw cut existing AC or concrete to the final limits determined in the field with City inspector, removal of existing AC or concrete surfacing, irrespective of existing AC depth, and preparation of roadway base aggregate as outlined in Sections 32 11 23, Aggregate Base Course, and 32 12 16, Asphalt Concrete Pavement, including the placement and compaction of new aggregate in accordance with Specifications. Payment for this item shall also include all hauling of materials to and from the project site. Any other work required to facilitate the cutting, removal, and disposal of AC, and placement and compaction of roadway base aggregate in preparation to receive HMAC shall be considered incidental to this bid item and be reflected in its unit price.

27. Hot-Mix Asphaltic Concrete (HMAC) Restoration, Class ½" PG 64-22: Payment for replacing removed surface with AC paving will be on a per ton basis. Work under this item shall include all labor, materials, and equipment required to furnish and install HMAC, 4-inch thickness minimum or matching existing pavement thickness (whichever is thicker), to restore existing

road pavement to the limits determined in the field with a City inspector, and re-establish rock base along shoulders. Contractor shall restore the existing roadway's width, grades and drainage as well as add crushed rock surfacing as required to re-establish gravel shoulders after paving has been completed. Payment for this item shall also include all hauling, screening, placing and compacting new HMAC, and sand sealing all joints. Adjustment of all valve boxes manhole frames and lids, roadway centerline monuments, and survey benchmarks shall be considered incidental to this bid item.

28. Perimeter Fence Replacement: Payment for removal and replacement of approximately 225 linear feet of existing chain link fence including addition of a chain link gate and all grading work required, as shown on the Drawings shall be made on a lump sum basis.

29. General Surface Restoration: Payment for general surface restoration including replacement of concrete curb where existing curb requires removal, stripping and stockpiling topsoil and (except where paid for elsewhere), regrading to original contours, bark mulching planting areas, and cleanup following construction including resurfacing gravel surfaces as required and final reseeding via hydroseeding will be on a lump sum basis, complete. Temporary fencing to secure site while permanent fence section is removed and also restoration and replacement of driveway damaged during pipe installation near approximate STA A7+00 shall be considered incidental to this bid item.

30. Ductile Iron Pipe Corrosion Monitoring System and Additional Anode Installation: Payment for furnishing and installing a ductile iron corrosion monitoring system on all of the new ductile iron pipe including insulating joints, joint bonding of pipes, valves and fittings, test stations, system testing, as well installing a reference electrode, monitoring coupons, and additional anodes to existing cathodic protection test stations located in the Right-of-Way near the intersection of West Avenue and Walnut Street, and all other requirements of the Drawings and Specifications, will be made on a lump sum basis, complete.

31. Trench Foundation Stabilization: Payment for overexcavation of unsuitable trench foundation materials and installation of coarse aggregate backfill material and non-woven geotextile for stabilizing unsuitable foundation conditions per the specifications, will only be considered as approved by the ENGINEER. When such pre-approval is obtained, payment will be made on a per cubic yard basis.

END OF SECTION

SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SUMMARY

A. This Section contains administrative and procedural requirements for submittals for review, information, and for Project closeout.

B. Section includes:

1. Schedule of Submittals.
2. Submittal requirements.
3. Submittal procedures.
4. Engineer review.
5. Resubmittal procedures.
6. Product data.
7. Shop Drawings.
8. Samples.
9. Design data.
10. Test reports.
11. Certificates.
12. Manufacturer's instructions.
13. Manufacturer's field reports.
14. Erection Drawings.
15. Construction progress schedules.
16. Breakdown of contract price.
17. Construction photographs.

1.2 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Engineer's responsive action.

B. Informational Submittals: Written and graphic information and physical Samples that do not require Engineer's responsive action. Submittals may be rejected for not complying with requirements.

1.3 SCHEDULE OF SUBMITTALS

A. Within 10 days after the Effective Date of the Contract, Contractor shall submit to Engineer a preliminary Schedule of Submittals, including proposed list of major

products proposed for use, with specification section reference, name of manufacturer, supplier, trade name, subcontractor and model number of each product. Provide a schedule of specific target dates for the submission and return of submittals and shop drawings required by the Contract Documents.

B. For products specified only by reference standards, indicate manufacturer, trade name, model or catalog designation, and reference standards.

C. The list and schedule shall be updated and resubmitted when requested by the Engineer.

D. Contractor's Schedule of Submittals will be acceptable to the Engineer if it provides a workable arrangement for reviewing and processing the required submittals.

1.4 SHOP DRAWING AND SAMPLE SUBMITTAL REQUIREMENTS

A. Before submitting a Shop Drawing or Sample, Contractor shall have:

1. reviewed and coordinated the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;

2. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;

3. determined and verified the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and

4. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.

B. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that submittal, and that Contractor approves the submittal.

C. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be set forth in a written communication separate from the Shop Drawings or Sample submittal; and, in addition, in the case

of Shop Drawings by a specific notation made on each Shop Drawing submitted to Engineer for review of each such variation.

1.5 SUBMITTAL PROCEDURES

A. Contractor shall submit Shop Drawings and Samples to Engineer for review in accordance with the accepted Schedule of Submittals.

B. Transmit each submittal with Engineer-accepted transmittal form certifying compliance with requirements of Contract Documents.

C. Sequentially number transmittal forms. Mark transmittal forms for resubmittals with original number and sequential alphabetic suffix.

D. Show each Submittal with the following numbering and tracking system:

1. Submittals shall be numbered according to specification section. For example, the first product submittal for Section 055000 would be “055000-1”. Resubmittals of that submittal would be “055000-1.1”, followed by “055000-1.2”, and so on. The second product submittal for that Section would be “055000-2”.

2. Submittals containing product information from multiple sections of the specifications will not be reviewed. Contractor and/or their supplier shall divide submittals in a manner that meets the numbering and tracking system requirements stated herein.

3. Alternative method of numbering may be used if acceptable to Engineer.

E. Identify: Project, Contractor, subcontractor and supplier, pertinent drawing and detail number, and specification Section number appropriate to submittal.

F. Apply Contractor's stamp, signed or initialed, certifying that review, approval, verification of products required, field dimensions, adjacent construction Work, and coordination of information is according to requirements of the Work and Contract Documents.

G. Coordinate submission of related items.

1. All shop drawings for interrelated items shall be scheduled for submission at the same time.

2. The Engineer may hold shop drawings in cases where partial submission cannot be reviewed until the complete submission has been received or where shop drawings cannot be reviewed until correlated items affected by them have been received. When such shop drawings are held, the Engineer

will advise the Contractor in writing that the shop drawing submitted will not be reviewed until shop drawings for all related items have been received.

H. When hard copies of submittals are provided by the Contractor, six (6) copies of all materials shall be provided to the Engineer. Two (2) copies of reviewed submittals will be kept by the Engineer, two (2) copies of reviewed submittals will be transmitted to the Owner, and two (2) copies of reviewed submittals will be returned to the Contractor. If the Contractor requests that more than two (2) copies of the reviewed submittal be returned, then the Contractor shall submit the appropriate quantity of submittals.

I. When electronic transmittals of submittals are provided by the Contractor under established protocols described elsewhere in the Contract Documents or as jointly developed by the Owner, Engineer and Contractor, provide electronic submittals in portable document format (PDF) in addition to the source document format (Word, Excel, AutoCAD, etc.). Reviewed submittals will be returned to the Contractor as PDF electronic files.

J. For each submittal for review, allow not less than fourteen (14) days for Engineer review, excluding delivery time to and from Contractor.

K. Identify variations in Contract Documents and product or system limitations that may be detrimental to successful performance of completed Work.

L. Allow space on submittals for Contractor and Engineer review stamps or comments.

M. When revised for resubmission, the Contractor shall identify changes made since previous submission. A narrative of changes shall be provided, and shop drawings or calculations shall indicate that a revision was made.

N. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report inability to comply with review comments.

O. Submittals not requested will not be recognized nor processed.

P. Incomplete Submittals: Engineer will not review. Complete submittals for each item are required. Delays resulting from incomplete submittals are not the responsibility of Engineer.

1.6 CONTRACTOR REVIEW

A. Review for compliance with Contract Document and approve submittals before transmitting to Engineer.

B. Contractor shall be responsible for:

1. Determination and verification of materials including manufacturer's catalog numbers.

2. Determination and verification of field measurements and field construction criteria.

3. Checking and coordinating information in submittal with requirements of Work and of Contract Documents.

4. Determination of accuracy and completeness of dimensions and quantities.

5. Confirmation and coordination of dimensions and field conditions at Site.

6. Construction means, techniques, sequences, and procedures.

7. Safety precautions.

8. Coordination and performance of Work of all trades.

C. Stamp, sign or initial, and date each submittal to certify compliance with requirements of Contract Documents. Any submittals received by the Engineer which do not bear the Contractor's approval or certification shall be returned without review.

D. When shop drawings and/or submittals are required to be revised or corrected and resubmitted, the Contractor shall make such revisions and/or corrections and resubmit those items or other materials in the same manner as specified above.

E. Regardless of corrections made in or review given to the drawings by the Engineer, the Contractor shall be responsible for the accuracy of such drawings and for their conformity to the Drawings and Specifications.

F. Do not fabricate products or begin Work for which submittals are required until approved submittals have been received from Architect/Engineer.

G. Materials and equipment shall be ordered a sufficient time in advance to allow time for reviews, and shall be available on the job when needed. Last minute review will not be given for inferior substitutes for material or equipment.

1.7 ENGINEER REVIEW

A. Informational submittals and other similar data are for Engineer's information, do not require Engineer's responsive action, and will not be reviewed or returned with comment.

B. The Engineer's review of submittals and shop drawings is not a check of any dimension or quantity and will not relieve the Contractor from responsibility for errors of any sort in the submittals and shop drawings.

C. Submittals made by Contractor that are not required by Contract Documents may be returned without action.

D. The Engineer will review the submitted data and shop drawings and return to the Contractor with notations thereon indicating "No Exception Taken", "Make Corrections Noted", "Rejected", "Revise and Resubmit", or "Submit Specified Item".

E. If more than two (2) submissions of an item are required to meet the Project specifications, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

F. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

G. Engineer's review will not extend to means, methods, techniques, sequences, or procedures of construction or to safety precautions or programs incident thereto.

H. Engineer's review of a separate item as such will not indicate approval of the assembly in which the item functions.

I. Engineer's review of a Shop Drawing or Sample shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 1.4.C and Engineer has given written acceptance of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer will document any such accepted variation from the requirements of the Contract Documents in a Field Order.

J. Engineer's review of a Shop Drawing or Sample shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 1.4 A. and B.

K. Engineer's review of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, shall not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.

L. Neither Engineer's receipt, review, return of a Shop Drawing, Sample, or other submittal shall result in such item becoming a Contract Document.

M. Contractor shall perform the Work in compliance with the requirements and commitments set forth in returned Shop Drawings and Samples, subject to the provisions of Paragraph 1.6.I.

1.8 RESUBMITTAL PROCEDURES

A. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.

B. Contractor shall furnish required submittals with sufficient information and accuracy to obtain required review of an item with no more than two submittals. Engineer will record Engineer's time for reviewing a third or subsequent submittal of a Shop Drawings, sample, or other item requiring review, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges.

C. If Contractor requests a change of a previously reviewed submittal item, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

PART 2 PRODUCTS

2.1 CONSTRUCTION PROGRESS SCHEDULES

A. Within ten (10) days after the Effective Date of the Contract, prepare and submit to the Engineer a practicable schedule showing the order in which the Contractor proposes to carry out the Work, the dates on which the important features of the work will start, and the contemplated dates for completing same. A time-scaled bar chart schedule shall include the following:

- Construction activities
- Submittal and review of critical material samples and shop drawings
- Procurement and delivery of critical materials
- Duration of work, including completion times of all stages and their sub-phases

B. Attention is drawn to typical local climatic weather patterns and Work shall be coordinated accordingly.

C. Complete project schedule shall be revised and resubmitted to the Engineer at a minimum occurrence of every four (4) weeks for review.

D. Three Week Lookahead Schedules: Provide each week at the weekly construction meeting. The previous week's completed work shall be shown on the schedule for a total of 4 weeks shown.

2.2 BREAKDOWN OF CONTRACT PRICE

A. Within ten (10) days after the Effective Date of the Contract, submit a complete breakdown of all lump sum bid items showing the value assigned to each part of the work, including an allowance for profit and overhead adding up to the total lump sum contract price.

B. Breakdown of lump sum bids shall be coordinated with the items in the schedule and shall be in sufficient detail to serve as the basis for progress payments during construction.

C. Engineer will review the contract price breakdown and may request items to be further broken down or for more items be added in order to facilitate tracking of work progress for payment.

D. Preparatory work, bonds, and insurance required in setting up the job will be allowed as a separate entry on the cost breakdown but shall not exceed 5 percent of the total base bid.

E. Upon acceptance of the breakdown of the contract price by the Engineer, it shall be used as the basis for all requests for payment.

2.3 PRODUCT DATA

A. Product Data: Action Submittal: Submit to Engineer for review for assessing conformance with information given and design concept expressed in Contract Documents. Submitted data shall be sufficient in detail for determination of compliance with the Contract Documents.

B. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

1. Note submittal will be returned to Contractor without review of submittal if products, models, options and other data are not clearly marked or identified.

C. Indicate product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

D. After review, produce copies and distribute according to Paragraph 1.5.M and for record documents.

2.4 SHOP DRAWINGS

A. Shop Drawings: Action Submittal: Submit to Engineer for assessing conformance with information given and design concept expressed in Contract Documents.

B. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

C. When required by individual Specification Sections, provide Shop Drawings signed and sealed by a professional Engineer licensed in the state of Project responsible for designing components shown on Shop Drawings.

1. Include signed and sealed calculations to support design.

2. Submit Shop Drawings and calculations in form suitable for submission to and approval by authorities having jurisdiction.

3. Make revisions and provide additional information when required by authorities having jurisdiction.

D. All dimensioned shop drawings shall be scalable and provided as full-sized (22” x 34”) sheets. PDF electronic files shall print as scalable full-sized sheets.

E. After review, produce copies and distribute according to Paragraph 1.5.M and for record documents.

2.5 SAMPLES

A. Samples: Action Submittal: Submit to Engineer for assessing conformance with information given and design concept expressed in Contract Documents.

B. Samples for Selection as Specified in Product Sections:

1. Submit to Engineer for aesthetic, color, and finish selection.

2. Submit Samples of finishes, textures, and patterns for Owner selection.

C. Submit Samples to illustrate functional and aesthetic characteristics of products, with integral parts and attachment devices. Coordinate Sample submittals for interfacing work.

D. Include identification on each Sample, with full Project information.

E. Submit number of Samples specified in individual Specification Sections; Engineer will retain one Sample.

F. Reviewed Samples that may be used in the Work are indicated in individual Specification Sections.

G. After review, produce copies and distribute according to Paragraph 1.5.M and for record documents.

2.6 DESIGN DATA

A. Informational Submittal: Submit data for Engineer's knowledge as Contract administrator or for Owner.

B. Submit information for assessing conformance with information given and design concept expressed in Contract Documents.

2.7 TEST REPORTS

A. Informational Submittal: Submit reports for Engineer's knowledge and records as Contract administrator or for Owner.

B. Submit test reports for information for assessing conformance with information given and design concept expressed in Contract Documents.

2.8 CERTIFICATES

A. Informational Submittal: Submit certification by manufacturer, installation/application Subcontractor, or Contractor to Engineer, in quantities specified for Product Data.

B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

C. Certificates may be recent or previous test results on material or product but must be acceptable to Engineer.

2.9 MANUFACTURER'S INSTRUCTIONS

A. Informational Submittal: Submit manufacturer's installation instructions for Engineer's knowledge as Contract administrator or for Owner.

B. Submit printed instructions for delivery, storage, assembly, installation, startup, adjusting, and finishing, to Engineer in quantities specified for Product Data.

C. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

2.10 MANUFACTURER'S FIELD REPORTS

A. Informational Submittal: Submit reports for Engineer's knowledge and records as Contract administrator or for Owner.

B. Submit report within 48 hours of observation to Engineer for information.

C. Submit reports for information for assessing conformance with information given and design concept expressed in Contract Documents.

2.11 ERECTION DRAWINGS

A. Informational Submittal: Submit Drawings for Engineer's knowledge and records as Contract administrator or for Owner.

B. Submit Drawings for information assessing conformance with information given and design concept expressed in Contract Documents.

C. Data indicating inappropriate or unacceptable Work may be subject to action by Engineer or Owner.

2.12 CONSTRUCTION PHOTOGRAPHS

A. Provide photographs of Site and construction throughout progress of Work.

B. Each month submit photographs with Application for Payment.

C. Photographs: Electronic, PDF or JPEG format.

D. Take two Site photographs from different directions indicating relative progress of the Work, five days maximum before submitting.

E. Identify each photo in the electronic file name. Identify name of Project, phase, orientation of view, date and time of view.

F. Digital Images: Deliver complete set of digital image electronic files on CD-ROM (or via internet) to Owner with Project record documents. Identify electronic media with date photographs were taken. Submit images that have same aspect ratio as sensor, uncropped.

1. Digital Images: Uncompressed TIFF format, produced by digital camera with minimum sensor size of 4.0 megapixels, and image resolution of not less than 1600 by 1200 pixels.

2. Date and Time: Include date and time in filename for each image.

2.13 OTHER REQUIRED SUBMITTALS

A. Other required submittals include the items listed below. This list is provided for Contractor's convenience only and may not be complete in all respects. Contractor shall provide all submittals specified or required, whether or not listed here.

1. Contractor Emergency Contact List.

2. Erosion and Sediment Control Plan.

3. Traffic Control and Protection Plan.

4. Record Drawings.

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 45 00

QUALITY CONTROL

PART 1 GENERAL

1.1 DESCRIPTION

A. This Section covers quality control requirements supplementary to those of the General Conditions and Technical Specifications.

1.2 PROVISIONS

A. Contractor's Responsibility for Testing

The CONTRACTOR shall be responsible for the cost of all testing as specified in this section. Additional information has been provided regarding the payment responsibility for the OWNER with regards to the Project.

B. OWNER's Right to Perform Additional Tests

The OWNER or ENGINEER reserves the right to complete additional testing. In such cases, the CONTRACTOR shall provide safe access for the OWNER or ENGINEER and their inspectors to adequately inspect the quality of work and the conformance with project specifications.

1.3 QUALITY ASSURANCE

A. Testing Requirements

An independently owned and operated laboratory approved by the ENGINEER shall perform all testing as specified herein.

B. Testing

1. General

a. All required testing of work and/or materials shall be conducted in the presence of the ENGINEER. The CONTRACTOR shall provide forty-eight (48) hour notification to the OWNER and OWNER's REPRESENTATIVE prior to conducting any and all quality assurance testing. Where applicable, work and materials shall only be buried with the consent of the ENGINEER.

b. Where such inspection and testing are to be conducted by an independent laboratory or agency, the sample or samples of material to be tested shall be

selected by such laboratory or agency or by the ENGINEER. The CONTRACTOR shall furnish such samples of all materials without charge to OWNER.

c. The results from any and all tests are made for the information of the OWNER. Regardless of any test results, the CONTRACTOR is solely responsible for the quality of workmanship and materials and for compliance with the requirements of the Drawings and Specifications.

2. Costs of Testing

a. The CONTRACTOR shall be responsible for and shall pay for all tests as specified in Part 3 of this Section. Additional information has been provided regarding the payment responsibility for the OWNER with regards to the Project.

b. With regards to all materials to be tested, where test results demonstrate that the material or workmanship does not meet the minimum requirements of the Contract Documents, additional testing shall be completed and shall be paid for by the CONTRACTOR with no reimbursement by the OWNER.

1.4 SPECIAL INSPECTIONS

Special inspections and testing as required by Chapter 17 of the IBC shall be conducted by OWNER-retained Special Inspectors and Testing Agencies as required and as indicated in the Contract Documents.

A. Special Inspectors and Testing Agencies Responsibilities

1. Verify that manufacturers maintain detailed fabrication and quality control procedures and review the completeness and adequacy of those procedures to perform the Work.

2. Promptly notify OWNER and CONTRACTOR of irregularities and deficiencies observed in the Work during performance of their services.

3. Submit certified written report of each test, inspection and similar quality control service to OWNER, CONTRACTOR and jurisdictional authorities. Interpret test results and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

4. Submit final report of special inspections at Substantial Completion, including a list of unresolved deficiencies.

5. Re-test and re-inspect corrected work.

B. CONTRACTOR'S Responsibilities

1. Provide quality requirements to all subcontractors and enforce all requirements.

2. Notify OWNER, ENGINEER, Special Inspectors and Testing Agencies at least 48 hours in advance of time when Work that requires testing or special inspecting will be performed, unless otherwise indicated in the Contract Documents.

3. Pay for any CONTRACTOR requested testing and inspecting not required by the Contract Documents.

4. Pay for any re-testing or re-inspections by Special Inspectors and Testing Agencies for replacement work resulting from work that failed to comply with the Contract Documents. OWNER will deduct such costs from the Contract Price.

5. Submit copies of licenses, certifications, correspondence, records and similar documents used to establish compliance with standards and regulations that pertain to performance of the Work to the OWNER, ENGINEER and Special Inspectors.

6. Where Special Inspection requires pre-construction testing for compliance with specified requirements for performance and test methods, comply with the following:

    a. Provide test specimens representative of proposed products and construction in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.

    b. Provide information on configurations of test assemblies, testing procedures and laboratory test records to adequately demonstrate capability of products to comply with performance requirements.

7. Cooperate with Agencies performing required tests, special inspections and similar quality control services. Notify Agencies in advance of operations to permit assignment of personnel. Provide the following:

    a. Access to the Work.

    b. Incidental labor, equipment and materials necessary to facilitate tests and special inspections.

    c. Adequate quantities of representative samples of materials that require testing and inspecting. Assist Agencies in obtaining samples.

    d. Provide facilities for storage and field curing of test samples.

    e. Deliver samples to Testing Agencies.

8. Coordinate sequence of activities to accommodate required quality-assurance and control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and special inspecting.

9. Schedule times for tests, special inspections, obtaining samples and similar activities. Distribute schedule to OWNER, ENGINEER, Special Inspectors, Testing Agencies and each party involved in portions of the work where tests and special inspections are required.

1.5 SUBMITTALS

A. Laboratory Test or Inspection Reports

Each report shall be signed and certified by the independently owned and operated testing laboratory. Unless otherwise specified, submit three (3) copies of each report to the OWNER or OWNER's REPRESENTATIVE.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.1 FIELD TESTING SCHEDULE

A. The CONTRACTOR shall complete field testing in accordance with the following schedule. Additional source material testing shall be completed as necessary to establish the basis of field tests. The frequency of testing listed in this schedule lists the minimum number of tests per quantity of work completed by the CONTRACTOR. Testing locations to be determined by the ENGINEER.

Material to be Tested	Payment Responsibility for Testing	Minimum Testing Frequency
Trench Backfill	CONTRACTOR	In-place compaction testing (w/ nuclear compaction gage) performed at 2-foot elevation increments, one test per 200 lineal feet of pipeline trench as measured along pipe centerline. ENGINEER may reduce frequency to one test per lift for every 1,500 lineal feet of pipeline trench when satisfied with CONTRACTOR's method of compaction. See Article 3.16, Field Quality Control of Section 31 23 17, Trenching for further details.

Material to be Tested	Payment Responsibility	Minimum Testing Frequency
Asphalt Concrete	CONTRACTOR	As required when placed. See detailed requirements in Article 3.3, Field Quality Control of Section 32 12 16, Asphalt Paving.
Concrete	CONTRACTOR	As required when placed. See detailed requirements in Article 3.12, Concrete Tests of Section 03 11 00, Concrete Work.
Waterline – Hydrostatic testing	CONTRACTOR	As required. See Section 33 13 00, Testing & Disinfection of Water Utility Piping.
Waterline - Disinfection	CONTRACTOR	As required. See Section 33 13 00, Testing and Disinfection of Water Utility Piping. Contractor to coordinate with Owner to collect Bac-T samples, and Owner to take custody of samples for delivery to lab for coliform testing. Contractor to pay all lab fees for testing as required.

END OF SECTION

SECTION 01 56 39

TEMPORARY TREE AND PLANT PROTECTION

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes provisions for temporary protection of trees and other plant life in preparation for site Work.

B. Related Sections:

1. Section 31 10 00 - Site Clearing.
2. Section 31 22 13 - Rough Grading.
3. Section 31 23 16 - Excavation.
4. Section 31 23 17 - Trenching.

C. This specification shall be applied concurrently and in conjunction with other plant material protection measures herein described and specified.

PART 2 MATERIALS - Not Used

PART 3 EXECUTION

3.1 INSPECTION

A. Inspect all trees specified on the Drawings for protection prior to construction.

1. Document with written memorandum and photographs any unusual conditions.

2. Submit copies of documentation to ENGINEER prior to beginning work.

B. Verify all conditions on the Drawings with actual conditions at Site regarding tree protection prior to any site disturbance.

C. The ENGINEER must be present during demolition of existing conditions occurring within the drip line of trees designated to remain.

D. Notify ENGINEER 24 hours prior to inspections and/or tagging of protected trees.

3.2 PROTECTION

A. Install barricades specified in the Drawings at drip lines of trees designated to remain prior to the commencement of construction.

B. Clearly designate protected trees and clear of any material storage, personnel, or vehicular movement.

C. Provide temporary fencing, barricades, and guards as necessary or required to protect trees designated on the Drawings to remain, from damage above and below grade.

D. Protect root systems of trees and plant life to remain.

1. Protect from damage due to noxious materials in solution caused by runoff or spillage during mixing and placement of construction materials.

2. Protect from flooding, erosion, or excessive wetting resulting from dewatering operations and compaction.

3. Protect against unauthorized cutting, breaking, skinning roots and branches, or bruising bark.

4. Protect from smothering and compaction.

a. Do not store construction materials or permit vehicles to drive or park within the drip line area of any tree to remain.

5. Protect from dumping of refuse in close proximity.

E. Where cutting is necessary, review conditions with the ENGINEER before proceeding, and comply with directives of ENGINEER.

3.3 EXCAVATION AROUND TREES

A. Excavate within drip lines of trees only where indicated on the Drawings or as directed by ENGINEER.

B. Where trenching for utilities is required within drip lines, tunnel under or around roots by hand excavating.

1. Where possible trench toward trunk of tree and tunnel under central root mass to avoid severing all lateral roots on side of trench.

2. Do not cut main lateral roots or tap roots over one inch in diameter.

3. Temporarily support and protect trees from damage until permanently covered with approved backfill.

C. Do not allow exposed roots to dry out before backfill is placed.

1. Provide temporary earth or burlap cover.

2. Water roots daily when exposed and maintain in a moist condition.

D. Backfill roots only upon inspection approval from the ENGINEER.

1. Backfill around root excavations only with clean imported topsoil free from materials deleterious to root growth.

2. Backfill to eliminate voids and compact only by means of manual tamping at root areas.

3. Water sufficiently to settle topsoil and eliminate voids or air pockets around roots.

4. Allow for natural settlement of soil surface, and furnish and apply topsoil sufficient to bring to original finish grade after backfill settlement.

E. If during excavation, any condition arises that threatens the survivability of the protected tree, or an unknown condition arises that affects the stability or integrity of the root system, notify the ENGINEER immediately.

3.4 REPAIR AND REPLACEMENT OF DAMAGED TREES

A. In the event of damage to existing trees:

1. Immediately prune limbs smaller than 3" caliper or roots smaller than 2" caliper to repair trees damaged by construction operations.

2. Make repairs promptly after damage occurs to prevent progressive deterioration of damaged trees.

3. Any such pruning and/or repairs shall be approved in advance and at completion by ENGINEER.

4. The ENGINEER shall reserve the right, at cost to the CONTRACTOR, to obtain the services of a Certified Consulting Arborist with current membership in the American Society of Consulting Arborists to determine the severity of damage.

5. The CONTRACTOR is responsible for the cost of repairs caused by their actions or by the actions of subcontractors engaged by the CONTRACTOR.

B. Remove and replace dead or damaged trees which are determined by the ENGINEER to be incapable of restoration to normal growth patterns at no additional cost to OWNER.

1. Provide new trees of the same species as those removed or damaged, with size and/or quantity to be determined by ENGINEER.

2. Furnish replacement trees and plant life to the Site and plant, maintain, and warranty as directed by the ENGINEER.

3. If trees are not replaceable with the same species, and size, compensate the OWNER for the replacement cost of the trees based on the evaluation of a Certified Consulting Arborist.

4. The CONTRACTOR is responsible for additional costs of removing damaged trees and labor for planting new specimens.

3.5 DESIGNATED TREE REMOVAL PROCEDURES

A. If designated tree removal is specified by ENGINEER, furnish labor, material, and equipment necessary for removing and/or salvaging existing trees, if necessary, as designated on the Drawings for removal.

1. Verify location and species with ENGINEER prior to removal.

B. Salable logs or timber may be sold to CONTRACTOR's benefit upon notification and prior approval of OWNER, unless otherwise shown on Drawings. Upon approval, remove salable logs or timber promptly from site.

3.6 DESIGNATED TREE TRANSPLANTING PROCEDURES

A. If designated tree transplanting is specified by ENGINEER, verify and identify existing trees to be transplanted.

B. All work shall be in accordance with the standards and practices outlined in the following: Tree and Shrub Transplanting Manual, E.B. Himelick, 1981 Ed., International Society of Arboriculture.

C. Prior to commencement of Work, submit a coordination schedule, method of transplanting, traffic control, routing, etc., to ENGINEER, for review and approval.

D. Warranty for transplanted trees shall be determined and directed on a case by case basis by the ENGINEER, upon contracting of specified transplanting work.

E. Review and verify location of utilities in area of operation. Obtain location and jurisdictional approval from utilities prior to transplanting activities. Protect utilities and the public at all times.

F. Prior to transplanting, spray trees with an anti-desiccant emulsion-type film forming agent, "Dowax" by Dow Chemical Company, "Wilt-Pruf" by Nursery Specialty Products Inc., "D-Wax", by Plant Products Inc., or approved equal, prior to digging with two separate applications allowing 48 hours apart. Use a power sprayer to provide an

adequate film over trunks, branches, stems, twigs, and foliage. Anti-desiccant must be dry prior to relocation.

G. Dig, ball and burlap, and move designated trees for relocation to the new planting location shown on the Drawings. In the event the new planting area is not prepared, place tree in a storage area approved by the ENGINEER solely designated for healing-in of plant materials until final planting may occur. Brace in a vertical position, provide shade, wind protection, and irrigation at plant storage area. Utilize all horticulturally proper methods for plant storage. Plants shall be maintained by CONTRACTOR while in storage.

3.7 GRADING AND FILLING AROUND TREES

A. Maintain existing grade within drip line of trees unless otherwise indicated on the Drawings or directed by the ENGINEER.

3.8 MAINTENANCE OF PROTECTIVE MEASURES

A. Maintain protective measures throughout the construction process. Immediately repair any alteration to protection measures throughout construction process. Repair or reinstall protective measures immediately upon alteration. Monitor protective measures daily.

B. Remove and clear area of debris and fencing, barricades, etc., upon final written approval of ENGINEER.

END OF SECTION

SECTION 02 30 00

SUBSURFACE INVESTIGATION

PART 1 GENERAL

1.1 SUMMARY

A. Subsurface investigations and reporting have been performed for the purpose of obtaining data for the planning and design of this project. Copies of such reporting are attached to the Contract Documents as Supplementary Information.

1.2 LIMITATIONS

A. The subsurface investigations and reporting are being made available solely for the convenience of the Bidder and shall not relieve the Bidder or the Contractor of any risk, duty to make examinations and investigations as required by Article 12 of the Information to Bidders, or any other responsibility under the Contract Documents.

B. It is mutually agreed to by all parties:

1. Written reports are reference documents and are not part of the Contract Documents.

2. Subsurface investigations are for the purpose of obtaining data for planning and design of the project.

3. Data concerning borings and test pits is intended to represent with reasonable accuracy conditions and material found in specific borings and test pits at the time the borings and test pits were made.

C. It is expressly understood and agreed the Owner and Engineer assume no responsibility whatsoever in respect to the sufficiency or accuracy of the investigation thus made, the records thereof, or of the interpretations set forth therein, or made by the Owner in his use thereof; and there is no warranty or guarantee, either expressed or implied, that the conditions indicated by such investigations, or records thereof, are representative of those existing throughout such areas, or any part, or that unforeseen developments may not occur.

D. The Owner’s subsurface investigations and reporting are made available to Bidder or Contractor only on the basis of the understandings and agreement herein stated.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 02 41 00

DEMOLITION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Demolition and removal of existing facilities.
2. Abandoning and removing utilities.

B. Related Sections:

1. Section 31 05 16 - Aggregates for Earthwork.
2. Section 31 10 00 - Site Clearing.
3. Section 31 22 13 - Rough Grading.
4. Section 31 23 16 - Excavation.
5. Section 33 11 50 - Existing Pipe Abandonment.

C. See Section 33 11 50 – Existing Pipe Abandonment, for asbestos abatement requirements for removal of existing abandoned pipeline with coating that contains asbestos along West Avenue.

1.2 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Submit to Engineer a copy of written permission of private property owners, with copy of fill permit for said private property, as may be required for disposal of materials.

1.3 QUALITY ASSURANCE

A. Existing Conditions: Determine the extent of work required and limitations before proceeding with Work.

B. Conform to applicable local, state and federal codes for environmental requirements in relation to disposal of debris.

1. Burning at the Site for the disposal of refuse, debris, and waste materials resulting from demolition and site clearing operations shall not be permitted.

C. Permits: The Contractor is responsible for obtaining all necessary permits required for completion of the Work described in this Section.

D. Protection of Persons and Property: Meet all federal, state and local safety requirements for the protection of workmen, other persons, and property in the vicinity of the Work and requirements of the General Provisions.

E. If the existing material to be demolished and removed contains any hazardous materials which will require special handling upon removal, such as asbestos or lead, it is the responsibility of the Contractor to remove and dispose of the material in accordance with all applicable federal, state and local regulations.

PART 2 PRODUCTS

2.1 MATERIALS

A. Existing Materials: All materials, equipment, miscellaneous items and debris involved, occurring or resulting from demolition, clearing and grubbing work shall become the property of the Contractor at the place of origin, except as otherwise indicated in the Drawings or Specifications.

B. Crushed Rock: As specified in Section 31 05 16-2.1, Aggregates for Earthwork. Of the size shown in the Drawings or specified herein.

C. Sand: As specified in Section 31 05 16-2.2, Aggregates for Earthwork.

PART 3 EXECUTION

3.1 EXAMINATION

A. The Owner assumes no responsibility for the actual condition of the facilities to be demolished. The Contractor shall visit the site, inspect all facilities and be familiar with all existing conditions and utilities.

B. Demolition drawings identify major equipment and structures to be demolished only. Auxiliary utilities such as water, air, chemicals, drainage, lubrication oil, hydraulic power fluid, electrical wiring, controls, and instrumentation are not necessarily shown shall be considered incidental to all demolition work.

C. Identify waste and salvage areas for placing removed materials.

3.2 PREPARATION

A. Carefully coordinate the work of this Section with all other work and construction.

B. Call Local Utility Line Information service at the telephone number listed below, not less than three working days before performing Work.

C. 1-800-332-2344, Oregon

1. Request underground utilities to be located and marked within and surrounding construction areas.

2. Disconnect or arrange for disconnection of utilities (if any) affected by required work.

3. Keep all active utilities intact and in continuous operations.

3.3 PROTECTION

A. Utilities: Locate, identify, and protect utilities located by utilities and indicated in the Drawings to remain from damage.

B. Survey control: Protect bench marks, survey control points, and existing structures from damage or displacement.

C. Preservation and Trimming of Trees, Shrubs and Other Vegetation: As specified in Section 31 10 00-3.4.C, Site Clearing.

D. Landscaped Areas: Protect existing landscaped areas as specified in Section 31 10 00-3.4.D, Site Clearing.

E. Miscellaneous Site Features: Protect all existing miscellaneous site features from damage by excavating equipment and vehicular traffic, including but not limited to existing structures, fences, mailboxes, sidewalks, paving, guy wires, utility poles, and curbs.

F. Repair and Replacement:

1. Damaged items, including but not restricted to those noted above, shall be repaired or replaced with new materials as required to restore damaged items or surfaces to a condition equal to and matching that existing prior to damage or start of Work of this contract.

2. Any damage to existing facilities or utilities to remain as caused by the Contractor's operations shall be repaired at the Contractor's expense.

3.4 DEMOLITION

A. Areas which are to be excavated for the purpose of demolition shall be cleared and stripped in accordance with Section 31 10 00-3.6, Clearing and Grubbing.

B. Carefully consider all bearing loads and capacities for placement of equipment and material on site. In the event of any questions as to whether an area to be loaded has

adequate bearing capacity, consult with Engineer prior to the placement of such equipment or material.

C. Demolition of Existing Structures:

1. Excavate around existing structures as required to perform demolition operations and to plug associated existing pipelines where shown in the Drawing.

2. Provide shoring, bracing, and supports, as required, to insure adjacent structures are not damaged and structural elements of existing structure are not overloaded during demolition activities.

    a. Increase structural supports or adding new supports as may be required as a result of any cutting, removal, or demolition work performed under any part of this Contract.

    b. Remove all temporary protection when the Work is complete or when so authorized by the Engineer.

3. Any floors that are to remain in place shall be completely cracked through to allow for drainage. Cracking shall be accomplished by dropping a demolition ball or by other methods approved by the Engineer.

4. Remove and dispose of all exposed and/or protruding metalwork, piping, plumbing and conduits resulting from demolition activities, and all woodwork, roofing, and electrical and mechanical equipment removed from demolished structures.

    a. Reinforcing bars shall be cut flush with final wall elevations as shown in the Drawings.

    b. No detached metalwork, excluding concrete reinforcing bars, shall be buried with the concrete and masonry rubble.

D. Backfill at Demolished Structures:

1. For structures designated to be abandoned and/or demolished in place, concrete and/or masonry rubble and excavated soils resulting from demolition activities shall be used for backfill or placed in the bottoms of said structures only as directed by the Engineer.

2. Concrete and masonry rubble used for backfilling shall be broken into pieces no larger than 12 inches on any one side.

3. Materials resulting from abandonment / demolition activities approved for backfill shall be combined with imported filler sand to create a dense, compacted backfill.

4. Backfilling or placement of the excavated material in the structures shall meet the following requirements.

    a. Furnish, place and compact filler sand along with the concrete and masonry rubble so that all voids are filled and a dense, compacted backfill is obtained.

    b. Filler sand shall be placed in horizontal layers completely filling all voids between pieces of rubble and not exceeding 12 inches in thickness.

    c. Each layer of filler sand shall be compacted to obtain at least 90 percent of maximum density as determined by ASTM Method D-698-78 (AASHTO T-99).

    d. Water shall be furnished by the Contractor and added to each layer as required to maintain optimum moisture content.

    e. The amount of filler sand used shall only be the amount needed to fill all voids created by placement of the concrete and asphalt rubble, as directed by the Engineer.

    f. At locations where concrete and masonry rubble is used for backfill, it shall be placed such that a minimum of 3 feet of compacted non-rubble backfill material (crushed rock) exists between any rubble and finished grade. Protruding reinforcing bars shall be cut to lengths that allow granular backfill to be placed and compacted to required levels in and above the rubble.

5. Disposal of all materials not used for backfill shall be performed off-site and in compliance with applicable local, state, and federal codes and requirements.

6. In areas where new construction will take place, no trace of these structures shall remain prior to placing of backfill.

E. Backfilling within the footprint of new structures with rubble material resulting from demolition activities will not be allowed.

F. All existing improvements designated in the Drawings or specified to be removed including but not limited to structures, pipelines, walls, footings, foundations, slabs, pavements, curbs, fencing and similar structures occurring above, at, or below existing ground surface shall be included in the demolition work.

G. Unless otherwise specified, any resulting voids shall be backfilled with suitable excavated or imported material compacted to the density of the adjacent soil.

3.5 EXISTING WATER UTILITY PIPING ABANDONMENT

A. As specified in Section 31 11 50, Existing Pipe Abandonment.

3.6 ASPHALTIC CONCRETE DEMOLITION

A. Asphalt pavement shall be removed to the limits shown in the Drawings.

B. The limits of the removal shall be saw cut.

C. Asphalt pavement may not be used as rubble fill.

3.7 REMOVAL

A. Remove debris, rock, excavated materials, rubble, abandoned piping and extracted plant life resulting from abandonment and/or demolition activities from site.

B. Continuously clean-up and remove waste materials from site. Do not allow materials to accumulate on site.

C. Removal: All material resulting from demolition, clearing and grubbing, and trimming operations shall be removed from the project site and disposed of in a lawful manner. Materials placed on property of private property owners shall be by written permission only.

3.8 GRADING

A. All grading work shall be completed in accordance with Section 31 22 13, Rough Grading.

3.9 CLEANUP:

A. During and upon completion of work, promptly remove all unused tools and equipment, surplus materials, debris, and dust and shall leave all areas affected by the work in a clean, condition, as may be subject to Engineer approval.

B. Adjacent structures shall be cleaned of dust, dirt and debris resulting from demolition.

C. Adjacent areas shall be returned to their existing condition prior to the start of work.

END OF SECTION

SECTION 03 11 00

CONCRETE WORK

PART 1 GENERAL

1.1 SUMMARY

A. The extent of concrete work is shown on the Drawings.

B. Work includes providing formwork and shoring for cast-in-place concrete and installation into formwork of items such as reinforcing steel bar (rebar), anchor bolts, setting plates, bearing plates, anchorages, inserts, reveals, frames, nosings, sleeves and other items to be embedded in concrete.

1.2 QUALITY ASSURANCE

A. Codes and Standards

Comply with the provisions of the following codes, specifications and standards, except as otherwise shown or specified here:

ACI 301 "Specifications for Structural Concrete for Buildings"

ACI 311 "Recommended Practice for Concrete Inspection"

ACI 318 "Building Code Requirements for Reinforced Concrete"

ACI 347 "Recommended Practice for Concrete Formwork"

ACI 304 "Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete"

Concrete Reinforcing Steel Institute, "Manual of Standard Practice"

Comply with building code requirements which are more stringent than the above and all OSHA requirements.

B. American Society for Testing and Materials (ASTM)

1. C31, Making and Curing Concrete Test Specimens in the Field.

2. C33, Specification for Concrete Aggregate.

3. C39, Compressive Strength of Cylindrical Concrete Specimens.

4. C40, Organic Impurities in Fine Aggregate for Concrete.

5. C85, Cement Content of Hardened Portland Cement Concrete.

6. C88, Soundness of Aggregates by use of Sodium Sulfate or Magnesium Sulfate.

7. C94, Standard Specifications for Ready-Mixed Concrete.

8. C131, Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

9. C136, Method for Sieve Analysis to Fine and Coarse Aggregate.

10. C143, Slump of Portland Cement Concrete.

11. C150, Standard Specification for Portland Cement.

12. C156, Water Retention by Concrete Curing Materials.

13. C173, Air Content of Freshly Mixed Concrete by the Volumetric Method.

14. C231, Air Content of Freshly Mixed Concrete by the Pressure Method.

15. C233, Standard Method of Testing Air-Entraining Admixtures for Concrete.

16. C260, Standard Specifications for Air-Entraining Admixtures for Concrete.

17. C289, Standard Test Method for Potential Reactivity of Aggregates (Chemical Method).

18. C441, Standard Test Method for Effectiveness of Mineral Admixtures in Preventing Excessive Expansion of Concrete Due to the Alkali-Aggregate Reaction.

19. C457, Microscopical Determination of Air-Void Content and Parameters of the Air-Void System in Hardened Concrete.

20. C494, Standard Specifications for Chemical Admixtures for Concrete.

21. C670, Preparing Precision Statements for Test Methods for Construction Materials.

22. C803, Penetration Resistance of Hardened Concrete.

C. Workmanship

The CONTRACTOR is responsible for correction of concrete work that does not conform to the specified requirements, including strength, tolerances and finishes. Correct deficient concrete as directed by the ENGINEER. The CONTRACTOR shall also be responsible for the cost of corrections to any other work affected by or resulting from

corrections to the concrete work.

D. Concrete Testing Service

The CONTRACTOR will engage a special inspector/testing laboratory to perform material evaluation tests. See detailed requirements in Part 3.14 “Quality Control Testing during Construction”. Per the OWNER or ENGINEER’s requirements the CONTRACTOR shall notify the designated representative to schedule the special inspections and materials testing required by the project documents.

E. Testing Requirements

Materials and installed work may require testing and retesting, as directed by the ENGINEER, at anytime during the progress of the work. Allow free access to material stockpiles and facilities at all times. All testing, including the retesting of rejected materials and installed work shall be done at the CONTRACTOR’s expense.

F. Tests for Concrete Materials

1. Test aggregates by the methods of sampling and testing of ASTM C33.

2. For Portland cement, sample the cement and determine the properties by the methods of test of ASTM C150.

3. Submit written reports to the ENGINEER, for each material sampled and tested prior to the start of work. Provide the project identification name and number, date of report, name of CONTRACTOR, name of concrete testing service, source of concrete aggregates, material manufacturer and brand name for manufactured materials, values specified in the referenced specification for each material, and test results. Indicate whether or not material is acceptable for intended use.

4. Certificates of material properties and compliance with specified requirements may be submitted in lieu of testing. The materials producer and the CONTRACTOR must sign certificates of compliance.

G. Allowable Tolerances:

1. Construct formwork to provide completed cast-in-place concrete surfaces complying with the tolerances specified in ACI 347, and as follows:

    a. Variation from plumb in lines and surfaces of columns, piers, walls and rises; 1/4-inch per 10 feet, but not more than 1-inch. For exposed corner columns, control joint grooves, and other conspicuous lines, 1/4-inch in any bay or 20 feet maximum; 1/2-inch maximum in 40 feet or more.

b. Variation from level or grade in slab soffits, ceilings, beam soffits, and rises 1/4-inch in 10 feet, 3/8-inch in any bay or 20 feet maximum, and 3/4-inch in 40 feet or more. For exposed lintels, sills, parapets, horizontal grooves and other conspicuous lines, 1/4-inch in any bay or 20 feet maximum and 1/2-inch in 40 feet or more.

c. Variation from position of the linear lines and related columns, walls, and partitions, 1/2-inch in any bay or 20 feet maximum, and 1-inch in 40 feet or more.

d. Variation in sizes and locations of sleeves, floor openings, and wall openings, 1/4-inch.

e. Variation in cross-sectional dimensions of columns and beams and thickness of slabs and walls, minus 1/4-inch and plus 1/2-inch.

f. Variations in footing plan dimensions, minus 1/2-inch and plus two (2) inches; misplacement or eccentricity, two (2) percent of the footing width in direction of misplacement but not more than two (2) inches; thickness reduction, minus five (5) percent.

g. Variation in steps - In a flight of stairs, 1/8-inch for rise and 1/4-inch for treads; in consecutive steps, 1/16-inch for rise and 1/8-inch for treads.

h. Circular structures shall be constructed in a true circular form, with maximum variation of 1/4-inch from the dimensions shown on the plans.

2. Before concrete placement check the lines and levels of erected formwork. Make corrections and adjustments to ensure proper size and location of concrete members and stability of forming systems.

3. During concrete placement check formwork and related supports to ensure that forms are not displaced and that completed work will be within specified tolerances.

H. Quality Control Testing During Construction

See Section 3 - Execution.

1.3 SUBMITTALS

A. For information only, submit manufacturer’s data with application and installation instructions for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, water stops, joint systems, chemical floor hardeners, dry-shake finish materials, and others. Bind and submit in one submittal.

B. Submit shop drawings for fabrication, bending and placement of concrete reinforcement. Comply with the ACE 315 “Manual of Standard Practice for Detailing Reinforced Concrete Structures” showing bar schedules, stirrup spacing, diagrams of bent bars, and arrangements of concrete reinforcement. Include special reinforcement required at openings through concrete structures.

C. Submit shop drawings for fabrication and erection of specific finished concrete surfaces as shown or specified. Show the general construction of forms including jointing, special formed joints or reveals, location and pattern of form tie placement, and other items which affect the exposed concrete visually. Submit form drawings for building columns, walls, fascias, and intersections, and concrete pan and joist system. Submit for typical sections only. ENGINEER’s review is for general architectural applications and features only. Design of formwork for structural stability and efficiency is the CONTRACTOR’s responsibility.

D. Submit laboratory test reports for concrete materials and mix design tests as specified.

E. Material Certificates may be provided in lieu of materials laboratory test reports. The material manufacturer and the CONTRACTOR, certifying that each material item complies with, or exceeds, the specified requirements shall sign material certificates.

1.4 CONCRETE MIX DESIGNS

A. All concrete materials shall be proportioned so as to produce a workable mixture in which the water content will not exceed the maximum specified.

B. If the concrete mix designs specified herein have not been used previously by the ready-mix supplier or if directed by the ENGINEER, mix proportions and concrete strength curves for regular cylinder tests, based on the relationship of 7, 14 and 28 day strengths versus slump values of two (2), four (4), and six (6) inches, all conforming to these Specifications, shall be established by an approved ready-mix supplier or an independent testing laboratory. A laboratory, independent of the ready-mix supplier, shall be required to prepare and test all concrete cylinders. The costs for preparation of mix designs (if required by the OWNER to be performed by an independent testing laboratory) and testing of concrete and materials shall be borne by the OWNER, except when materials do not meet specified requirements, in which case such costs shall be borne by the CONTRACTOR.

C. The exact proportions by weight of all materials entering into the concrete delivered to the jobsite shall conform to the approved mix design unless specifically so directed by the ENGINEER or Laboratory for improved specified strength or desired density, uniformity and workability.

D. The proportions of such mix design shall be based on a full cubic yard of hardened concrete.

E. Ready-mix companies or jobsite batch plants shall furnish delivery tickets, signed by a Certified Weighmaster, on which each shall state the weight of aggregates, sand, cement, admixtures and water and the number of cubic yards of concrete furnished, which will be compared against the approved mix design.

F. There shall be no variation in the weights and proportions of materials from the approved mix design.

G. There shall be no variation in the quality and source of materials once they have been approved for the specific mix design.

1.5 READY-MIXED CONCRETE

Ready-mixed concrete shall conform to the requirements of ACI 301 and ASTM C 94. In case of conflict, ACI 301 shall govern.

1.6 SAMPLE

CONTRACTOR shall pour and finish one 2-foot square exposed aggregate concrete sample for ENGINEER's approval prior to construction if exposed aggregate is included on job.

1.7 JOB CONDITIONS

Maintain continuous traffic control and access for vehicular and pedestrian traffic as required for other construction activities as well as to adjoining facilities for regular operation. Utilize flagmen, barricades, warning signs and warning lights as required, to maintain a safe entrance and passage on all roads or drives abutting the project.

PART 2 PRODUCTS

2.1 WALL FORMS

A. Full Height Pours: The wall form design shall be such that wall sections can be poured full height without creating horizontal cold joints and without causing snapping of form ties which shall be of sufficient strength and number to prevent spreading of the forms during the placement of concrete and which shall permit ready removal of the forms without spalling or damaging the concrete.

B. Wall Form Ties

1. Form ties which remain in the wall of a subgrade water-retaining structure shall have waterstops and a one inch minimum breakback or cone depth.

2. Snap ties, if used, shall not be broken until the concrete has reached the design concrete strength. Snap ties, designed so that the ends must be broken off before

the forms can be removed, shall not be used. The use of tie wires as form ties will not be permitted. Fully threaded stub bolts may be used in lieu of smooth ties with waterstops.

3. Taper ties with plastic or rubber plugs of an approved and proven design may also be used. The plugs must be driven into the hole with a steel rod, placed in a cylindrical recess made therefore in the plug. At no time shall plugs be driven on the flat area outside the cylindrical recess. Plugs shall be A-58 SURE PLUG as manufactured by DAYTON SUPERIOR, Santa Fe Springs, CA; phone: (714) 522-3442.

4. Ties shall positively secure the wall to the required dimension and hold the wall to that dimension prior to and during concrete placement.

C. Wall Form Stiffeners

1. Horizontal walers shall consist of structural steel channels, angles or tubing of adequate size to retain the concrete without deflecting.

2. The walers shall be rolled or welded to the proper radii or offset brackets shall be used for shaping the wall to the dimensions shown on the Drawings and shall be used both for inside and outside wall forms in direct contact with the wall panels and at vertical spacings of no more than 96 inches on center.

3. There shall be at least one such waler within 24 inches of the top and bottom of the wall.

4. The largest dimension of the steel waler shall be in the radial direction.

5. Vertical structural steel or wood members shall be used at a minimum horizontal spacing of 74 inches and shall have sufficient rigidity and strength to insure the proper vertical alignments with the aid of braces under all predictable stress conditions.

6. In lieu of the above, a different system and spacings may be used if it is satisfactorily demonstrated to the ENGINEER that it will be equally effective.

2.2 FORMS FOR UNEXPOSED FINISH CONCRETE

A. Form concrete surfaces which will be unexposed in finished structure with plywood, lumber, metal or other acceptable material. Provide lumber dressed on at least two (2) edges and one (1) side for tight fit.

2.3 FORM MATERIALS

A. Form Coatings

Provide commercial formulation form-coating compounds that will not bond with, stain nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces requiring bond or adhesion, nor impede wetting of surfaces to be cured with water or curing compound. Petroleum based coatings shall not be used for structures in creeks and waterways. Biodegradable coatings shall be used which will not contaminate the creeks/waterways or an alternate method for stripping the form shall be proposed.

B. Chamfers, Reveals, Drips

Provide preformed PVC or shaped wood or metal of size and profile as shown on drawings.

C. Inserts

Provide metal inserts for anchorage of materials or equipment to concrete construction, not supplied by other trades and as required for the work. Provide “Parabolt” by the Molly Company, “Phillips Red-Head”, or “Burke” products. The CONTRACTOR is responsible for insuring that all required anchorage not specified in the project documents is installed per current building code and applicable ICC report requirements.

2.4 REINFORCING MATERIALS

A. Reinforcing Bar (rebar): ASTM A615 and as follows below>

Stirrups and Ties	Grade 60 (Grade 40 may be used for #3 and smaller)
All other Uses	Grade 60

B. Steel Wire: ASTM A82, plain, cold-drawn, steel.

C. Welded Wire Fabric (WWF): ASTM A185, welded steel wire fabric.

D. Supports for Reinforcement

Provide supports for reinforcement including bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing bars and welded wire fabric in place. Use wire bar type supports complying with CRSI recommendations, unless otherwise specified. Wood, brick, concrete blocks and other devices will not be acceptable. For slabs-on-grade, use supports with sand plates or horizontal runners where wetted base materials will not support chair legs. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs that are hot-dip galvanized, after fabrication, or plastic protected or stainless steel protected.

E. Fiber Reinforcement – Collated polypropylene fiber, ¾”-inch, manufactured from 100% virgin homopolymer polypropylene, hydrophobic, in compliance with ASTM C116.

2.5 CONCRETE MATERIALS

A. Portland Cement

ASTM C150, Type II, unless otherwise acceptable to ENGINEER. Use only one (1) brand of cement throughout the project, unless otherwise acceptable to the ENGINEER. The use of ground granulated blast furnace slag is not allowed.

B. Aggregates

ASTM C33 and as herein specified. Provide aggregates from a single source for all exposed concrete.

Local aggregates not complying with ASTM C33 but which have shown by special test or actual service to produce concrete of adequate strength and durability may be used when acceptable to the ENGINEER.

1. Fine Aggregate - Clean, sharp, natural sand free from loam, clay, lumps or other deleterious substances. Dune sand, bank-run sand and manufactured sand are not acceptable.

2. Coarse Aggregate - Clean, uncoated, processed aggregate containing no clay, mud, loam or foreign matter, as follows:

    a. Crushed stone processed from natural rock or stone.

    b. Washed gravel, either natural or crushed. Use of pit or bank run gravel is not permitted.

    c. Maximum Aggregate Size - Not larger than one-fifth (1/5) of the narrowest dimensions between sides of forms, one-third (1/3) of the depth of slabs, nor three-fourths (3/4) of the minimum clear space between individual reinforcing bars or bundles of bars.

3. These limitations may be waived if, in the judgment of the ENGINEER, workability and methods of consolidation are such that concrete can be placed without honeycomb or voids.

4. In general it is desired that normal commercial mixes using 1-1/2-inch or 3/4-inch maximum aggregate size be used.

5. Aggregate for exposed aggregate concrete shall consist of selected aggregate of washed clean river gravel in color range of medium to dark in browns and grays; material uniformly sized 5/8-inch to 3/4-inch.

C. Water: Clean, fresh, drinkable.

D. Air Entraining Admixture: ASTM C260.

E. Water-Reducing Admixture: ASTM C494, Type A.

F. Set-Control Admixtures: ASTM C494, as follows:

1. Type B, Retarding.
2. Type C, Accelerating.
3. Type D, Water-reducing and Retarding.
4. Type E, Water-reducing and Accelerating.

Calcium chloride will not be permitted in concrete, unless otherwise authorized in writing by the ENGINEER.

2.6 RELATED MATERIALS

A. Bituminous and Fiber Joint Filler

Provide resilient and non-extruding type premolded bituminous impregnated fiberboard units complying with ASTM D1751, FS HH-F-341, Type 1 and AASHTO M 213. Provide one of the following products:

1. Elastite; Philip Carey/Celotex

2. Flexcell; Celotex Corp.

3. Crane Fiber 1390; W.R. Grace & Co.

4. Fibre; W.R. Meadows, Inc.

5. Tex-Lite; J & P Petroleum Prod. Inc.

6. Sonoflex; Sonneborn/Contech, Inc.

B. Joint Sealing Compound: See Section 07 92 00, Joint Sealants.

C. Moisture Barrier

Provide moisture barrier cover over all prepared base material. Use only materials that are resistant to decay when tested in accordance with ASTM E154. The moisture barrier consists of heavy Kraft papers laminated together with glass fiber

reinforcement and overcoated with black polyethylene on each side. Provide Moistop, St. Regis, or equal.

D. Form Ties (for forms other than wall forms)

Factory-fabricated, adjustable-length, removable or snapoff metal form ties, designed to prevent form deflection, and to prevent spalling concrete surfaces upon removal. Unless otherwise shown, provide ties so portion remaining within concrete after removal is at least 1-1/2 inches inside concrete. Unless otherwise shown, provide form ties, which will not leave holes larger than 1-inch in diameter in concrete surface.

E. Concrete Curing Materials

Acrylic curing and sealing compound - Water emulsion acrylic curing and sealing compound formulated of acrylic polymers of water based carrier. W.R. Meadows, Inc. VOCOMP-20 or approved equal.

F. Epoxy Adhesive

Provide Sikadur Hi-Mod (Sikastik 370) or Sikadur Hi-Mod Gel (Sikastix 390) for application to wire-brushed and prepared existing concrete to be mated to new concrete. Apply per manufacturer's recommendations.

G. Chemical-Hardener Finish: Provide Hornolith from Tamms Industries, or approved equal.

H. Non-shrink Grout: See Section 03 60 00, Grouting.

2.7 PROPORTIONING NORMAL CONCRETE

A. Proportion mixes by either laboratory trial batch or field experience methods, using materials to be employed on the project for each class of concrete required, complying with ACI 211.1. All measurements shall be by weight. All concrete admixtures will either be by the same supplier to insure compatibility. If different suppliers are used a memorandum from EACH admixture supplier will be provided stating the compatibility of their product with the other supplier's products.

B. The slump shall be between two inches and four inches when tested in accordance with ASTM Specifications C 143. Variations in the slump range may be allowed by the ENGINEER if admixtures, such as water reducers or superplasticizers, are utilized in the concrete mix. Regardless of the measured slump, the maximum allowable water-cement ratios as specified here-in, shall be strictly adhered to.

C. Compressive Strength, Water and Cement Content

Not withstanding what has been stated here-before, and unless shown otherwise on

the Drawings, the concrete shall meet the following requirements. All concrete except as noted otherwise on the drawings shall have 4,000 psi 28-day compressive strength. The maximum water content per 94 pound sack of cement is 4.5 gallons. The minimum cement content for the 4,000psi mix is 6.0 sacks (94 pound sack of cement per cubic yard of concrete). Up to a maximum of 15% of cementatious material may be fly ash in accordance with ASTM C618. The use ground granulated blast furnace slag is not allowed.

D. Retarding Densifiers

1. All concrete (as defined in 2.9 below) used for wall construction shall also contain DARATARD-17, as manufactured by Grace Const. Products, Cambridge, MA or MBL-82, as manufactured by Master Builders, Cleveland, OH in the amounts recommended by the additive manufacturer whenever the air temperature during the pour exceeds 85° F.

2. To be considered as equal, any alternate product offered for consideration shall contain no calcium chloride, and shall be compatible with air-entrained cements and air-entraining admixtures conforming to the applicable ASTM, AASHTO, ANSI and Federal specifications.

3. CONTRACTOR shall certify that admixtures do not contain calcium chlorides or other corrosive materials.

E. Air-Entraining Agents

1. All concrete that that is specified to be air entrained or that may be exposed to freeze/thaw action either during construction or the service life of the structure must be air entrained. Sufficient air-entraining agent shall be used to provide total air content of 5 percent, +/- 1 percent.

2. Air-entraining agents shall meet ASTM C 260, ASTM C 233 and ASTM C 457.

3. The maximum total volumetric air content of the concrete before placement shall be six (6) percent plus or minus one percent as determined by ASTM C 173 or ASTM 231.

4. Subject to these Specifications, consideration will be given to the following products: PROTEX “AES,” GRACE “DAREX AEA,” MASTER BUILDERS “MB-AE10,” or SIKA CHEMICAL “AER.”

F. Water Reducing Admixtures

1. In addition to air-entrainment, approved water reducing additives, which do not affect the ultimate performance of any steel in any way, may be added to maintain

the maximum water content below that specified herein. Water reducing additives shall conform to ASTM C 494, Type A or D.

2. The use of water reducing additives shall not permit a reduction in the minimum specified cement content or in the specified amount of air-entrainment.

3. Admixtures shall contain no calcium chloride, tri-ethanolamine or fly ash. All admixtures shall be from the same manufacturer.

4. Superplasticizers, if allowed by the ENGINEER, shall conform to ASTM C 494, Type F or G, batch plant added using second or third generation only.

5. Set control admixtures if allowed by the ENGINEER, shall conform to ASTM C 494, Type B (retarding) or Type C (accelerating).

G. Fiber reinforcement admixture shall be included in the ready-mix concrete design used for filling and channeling the wet well chambers. Fibers shall be used in strict accordance with the manufacturer's directions.

2.8 CONCRETE MIXING

Ready-Mix Concrete - Comply with the requirements of ASTM C94, and as herein specified. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C94 may be required. When the air temperature is between 85°F and 90°F, reduce the mixing and delivery time from 1-1/2 hours to 75 minutes, and when the air temperature is above 90°F, reduce the mixing and delivery time to 60 minutes.

PART 3 EXECUTION

3.1 FORMS

A. Design, erect, support, brace and maintain formwork to support vertical and lateral loads that might be applied until such loads can be supported by the concrete structure. Construct formworks so concrete members and structures are of correct size, shape, alignment, elevation and position.

B. Design formworks to be readily removable without impact shock, or damage to cast-in-place concrete surfaces and adjacent materials.

C. Construct forms complying with ACI 347, to sizes, shapes, lines and dimensions shown, and to obtain accurate alignment, location, grades, level and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts

and other features required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide backup at joints to prevent leakage of cement paste.

D. Fabricate forms for easy removal without hammering or prying against the concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and for easy removal.

E. Erect falsework and support; brace and maintain it to safely support vertical, lateral and asymmetrical loads applied until such loads can be supported by in-place concrete structures.

Provide shores and struts with positive means of adjustment capable of taking up formwork settlement during concrete placing operations, using wedges or jacks or a combination thereof. Provide trussed supports when adequate foundations for shores and struts cannot be secured.

Support form facing materials by structural members spaced sufficiently close to prevent deflection. Fit forms placed in successive units for continuous surfaces to accurate alignment, free from irregularities and within allowable tolerances.

F. Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings of forms at inconspicuous locations.

G. Chamfer exposed corners and edges, reveals and drips as shown using wood, metal, PVC or rubber strips fabricated to produce uniform smooth lines and tight edge joints.

H. Provisions for Other Trades - Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses and chases from trades providing such ties. Accurately place and securely support items built into forms.

I. Cleaning and Tightening - Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt or other debris just before concrete is placed. Retighten forms after concrete placement if required to eliminate mortar leaks.

3.2 PLACING REINFORCEMENT

Detail and place according to ACI Manual SP-66. Unless otherwise noted, minimum cover shall be 1-1/2 inches for No. 5 and smaller bars, two (2) inches for No. 6 and larger bars and three (3) inches when poured against earth. Unless otherwise noted, bend all horizontals reinforcing a minimum of two (2) feet at corners and wall intersections.

A. Clean reinforcement of loose rust and mill scale, earth, ice and other materials which reduce or destroy bond with concrete.

B. Accurately position, support and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers and hangers, as required.

C. Place reinforcement to obtain at least the minimum coverages for concrete protection. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces. Do not place reinforcing bars more than two inches beyond the last leg of continuous bar support. Do not use supports as bases for runways for concrete conveying equipment and similar construction loads.

D. Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh plus two (2) inches, and lace splices with wire. Offset end laps in adjacent widths to prevent continuous laps in either direction.

3.3 JOINTS

A. Construction Joints - Locate and install construction joints, which are not shown on the drawings, so as not to impair the strength and appearance of the structure, as acceptable to the ENGINEER.

B. Place construction joints perpendicular to the main reinforcement. Continue all reinforcement across construction joints. Unless otherwise specified, reinforcement shall be lapped in accordance with ACI Standards.

3.4 INSTALLATION OF EMBEDDED ITEMS

A. General - Set and build into the work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions and directions provided by suppliers of the items to be attached thereto.

B. Edge Forms and Screed Strips for Slabs - Set edge forms or bulkheads and intermediate screed strips for slabs to obtain the required elevations and contours in the finished slab surface. Provide and secure units sufficiently strong to support the types of screed strips by the use of strike-off templates or accepted compacting type screeds.

C. Cast in Place Reglets - Place in straight and continuous lines as detailed to enable flashing to be applied continuously without deviation at reglet joints more than 1/8-inch. Miter corners for continuous reglet joint where outside corners occur. At inside corners extend one section 1-inch past corner. Adequately anchor or secure reglets per manufacturer’s instructions prior to pouring and during construction to insure

dimensional tolerances and alignment. Vibrate concrete to insure concrete cover adjacent to and around reglet. Visually inspect after pour and patch as required.

3.5 PREPARATION OF FORM SURFACES

Coat the contact surfaces of forms with a form-coating compound before reinforcement is placed. Thin formcoating compounds only with thinning agent of type, and in amount, and under conditions of the form-coating compound manufacturer's directions. Use dissipating-type form oil at surfaces to receive cement plaster finish. Do not allow excess form-coating material to accumulate in the forms or to come into contact with concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions. Coat steel forms with a non-staining, rust-preventative form oil or otherwise protect against rusting. Rust-stained steel formwork is not acceptable.

3.6 CONCRETE PLACEMENT

A. Pre-Placement Inspection

1. Before placing concrete, inspect and complete the formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other crafts involved in ample time to permit the installation of their work; cooperate with other trades in setting such work as required. Notify ENGINEER in time for inspection prior to pouring.

2. Thoroughly wet wood forms immediately before placing concrete, as required where form coatings are not used.

3. Coordinate the installation of joint materials and moisture barriers with placement of forms and reinforcing steel.

4. Concrete Curbs and Paving - Do not place concrete until subbase is completed and approved by the ENGINEER as required to provide uniform dampened condition at the time concrete is placed. Moisten subbase as required to provide uniform dampened condition at the time concrete is placed.

B. Place concrete in compliance with the practices and recommendations of ACI 304 and as herein specified.

1. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness within the section. If a section cannot be placed continuously, provide construction joints as herein specified. Perform concrete placing at such a rate that concrete, which is being integrated, with fresh concrete is still plastic. Deposit concrete as nearly as practicable to its final location to avoid segregation due to rehandling or flowing. Do not subject concrete to any procedure, which will cause segregation.

2. Screed concrete which is to receive other construction to the proper level to avoid excessive skimming or grouting.

3. Do not use concrete which becomes non-plastic and unworkable or does not meet the required quality control limits or which has been contaminated by foreign materials. Do not use retempered concrete. Remove rejected concrete from the project site and dispose of in an acceptable location. Do not use concrete whose allowable mixing time has been exceeded.

C. Concrete Conveying

1. Handle concrete from the point of delivery and transfer to the concrete conveying equipment and to the locations of final deposit as rapidly as practicable by methods, which will prevent segregation and loss of concrete mix materials.

2. Provide mechanical equipment for conveying concrete to ensure a continuous flow of concrete at the delivery end. Provide runways for wheeled concrete conveying equipment from the concrete delivery point to the locations of final deposit. Keep interior surfaces of conveying equipment, including chutes, free of hardened concrete, debris, water, snow, ice and other deleterious materials.

3. The CONTRACTOR shall provide traffic control on the narrow access roads to the work sites.

4. The CONTRACTOR shall not wash concrete trucks/chutes/equipment off at the project site unless plastic tarps and hay bales are employed to contain the concrete. The CONTRACTOR will be required to haul off-site all concrete contaminated soil.

D. Placing Concrete into Forms

1. Deposit concrete in forms in horizontal layers not deeper than 24 inches and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.

2. Do not interrupt successive placement; do not permit cold joints to occur.

3. Remove temporary spreaders in forms when concrete placing has reached the elevation of such spreaders.

4. Consolidate concrete placed in forms by mechanical vibrating equipment supplemented by hand spading, rodding or tamping. Use equipment and procedures for consolidation of concrete in accordance with the recommended practices of ACI 309, to suit the type of concrete and project conditions. Vibration of forms and reinforcing will not be permitted.

5. Do not use vibrators to transport concrete inside of forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than the visible effectiveness of the machine. Place vibrators to rapidly penetrate the layer of concrete at least six (6) inches into the preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion, limit the duration of vibration to the time necessary to consolidate the concrete and complete embedment of reinforcement and other embedded items without causing segregation of the mix.

6. Do not place concrete in supporting elements until the concrete previously placed in columns and walls is no longer plastic.

E. Bonding

1. Roughen surfaces of set concrete at all joints except where bonding is obtained by use of concrete bonding agent, and clean surfaces of laitance, coatings, loose particles and foreign matter. Roughen surfaces in a manner to expose bonded aggregate uniformly and not to leave laitance, loose particles of aggregate or damaged concrete at the surface.

2. Prepare for bonding of fresh concrete to new concrete that has set but is not fully cured, as follows:

   a. At joints between footings and walls or columns, and between walls or columns and beams or slabs they support, and elsewhere unless otherwise specified herein, dampen, but do not saturate, the roughened and cleaned surface of set concrete immediately before placing fresh concrete.

   b. At joints in exposed work; at vertical joints in walls; at joints in girders, beams, supported slabs and other structural members; and at joints designed to contain liquids; dampen, but do not saturate the roughened and cleaned surface of set concrete and apply a liberal coating of neat cement grout.

   c. Use neat cement grout consisting of equal parts Portland cement and fine aggregate by weight and not more than six (6) gallons of water per sack of cement. Apply with a stiff broom or brush to a minimum thickness of 1/16-inch. Deposit fresh concrete before cement grout has attained its initial set.

   d. In lieu of neat cement grout, bonding grout may be a commercial bonding agent. Apply to cleaned concrete surfaces in accordance with the printed instructions of the bonding material manufacturer.

3. Prepare for bonding of fresh concrete to fully cured hardened concrete or existing concrete by using an epoxy-resin-bonding agent as follows:

a. Handle and store epoxy-resin adhesive binder in compliance with the manufacturer's printed instructions, including safety precautions.

b. Mix the epoxy-resin adhesive binder in the proportions recommended by the manufacturer, carefully following directions for safety of personnel.

c. Before depositing fresh concrete, thoroughly roughen and clean hardened concrete surfaces and coat with epoxy-resin grout not less than 1/16-inch thick. Place fresh concrete while the epoxy-resin material is still tacky, without removing the in-place grout coat, and as directed by the epoxy-resin manufacturer.

F. Cold Weather Placing

1. Protect all concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with the requirements of ACI 306 and as herein specified.

2. When the air temperature has fallen to or is expected to fall below 40°F, provide adequate means to maintain the temperature in the area where concrete is being placed at either 70°F for three (3) days or 50°F for five (5) days after placing. Provide temporary housing or coverings including tarpaulins or plastic film. Keep protections in place and intact at least 24 hours after artificial heat is discontinued. Keep concrete moist. Avoid rapid dry-out of concrete due to over-heating and avoid thermal shock due to sudden cooling or heating.

3. When air temperature has fallen to or is expected to fall below 40°F, uniformly heat all water and aggregates before mixing as required to obtain a concrete mixture temperature of not less than 50°F, and not more than 80°F, at point of placement.

4. Do not use frozen materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials. Ascertain that forms, reinforcing steel and adjacent concrete surfaces are entirely free of frost, snow and ice before placing concrete.

5. Do not use calcium chloride, salt and other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.

G. Hot Weather Placing

1. When hot weather conditions exist that would seriously impair the quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.

2. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90°F. Mixing water may be chilled, or chopped ice may be used

to control the concrete temperature provided the water equivalent of the ice is calculated to the total amount of mixing water.

3. Cover reinforcing steel with water soaked burlap if it becomes too hot so that the steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.

4. Wet forms thoroughly before placing concrete.

5. Do not use retarding admixtures unless otherwise accepted in mix designs.

3.7 FINISH OF FORMED SURFACES

A. Rough Form Finish

For formed concrete surfaces not exposed to view in the finish work or covered by other construction, unless otherwise shown or specified. This is the concrete surface having the texture imparted by the form facing material used, with tie holes and defective areas repaired and patched and fins and other projections exceeding 1/4-inch in height rubbed down or chipped off.

B. Related Unformed Surfaces

At tops of walls, horizontal offsets and similar unformed surfaces occurring adjacent to formed surfaces, strike off smooth and finish with a texture matching the adjacent formed surfaces. Continue the final surface treatment of formed surfaces uniformly across the adjacent unformed surfaces, unless otherwise shown.

3.8 CONCRETE CURING AND PROTECTION

A. General

1. Protect freshly placed concrete from premature drying and excessive cold or hot temperature and maintain without drying at a relatively constant temperature for the period of time necessary for hydration of the cement and proper hardening of the concrete.

2. Start initial curing as soon as free moisture has disappeared from the concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 72 hours.

3. Begin final curing procedures immediately following initial curing and before the concrete has dried. Continue final curing for at least seven (7) days and in

accordance with ACI 301 procedures. Avoid rapid drying at the end of the final curing period.

B. Curing Methods

Perform curing of concrete by moist curing, by moisture-retaining cover curing, by membrane curing or by combinations thereof, as herein specified. Provide the curing methods indicated as follows:

1. For concrete floor slabs provide moisture curing, moisture cover curing or liquid membrane/chemical curing-hardening curing. If liquid membrane curing is used, it must be compatible with concrete hardening compounds to be applied later.

2. For other concrete work, provide moisture curing or moisture cover curing. Do not use liquid membrane or chemical curing-hardening curing on any concrete work to receive any applied finishes.

3. For curing, use only water that is free of impurities, which could etch or discolor exposed, natural concrete surfaces.

4. Provide moisture curing by any of the following methods:

    a. Keeping the surface of the concrete continuously wet by covering with water.

    b. Continuous water-fog spray.

    c. Covering the concrete surface with the specified absorptive cover thoroughly saturated with water and keeping the absorptive cover continuously wet. Place absorptive cover so as to provide coverage of the concrete surfaces and edges with a 4-inch lap over adjacent absorptive covers.

5. Provide moisture-cover curing as follows - Cover the concrete surfaces with the specified moisture-retaining cover for curing concrete placed in the widest practicable width with sides and ends lapped at least three (3) inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during the curing period using cover material and waterproof tape.

6. Provide liquid membrane curing as follows:

    a. Apply the specified membrane-forming curing compound to damp concrete surfaces as soon as the water film has disappeared. Apply uniformly in a coat continuous operation by power spray equipment in accordance with the manufacturer’s directions. Recoat areas, which are subjected to heavy rainfall within three (3) hours after initial application. Maintain the continuity of the coating and repair damage to the coat during the entire curing period.

b. Do not use membrane-curing compounds on surfaces, which are to be covered with a coating material applied directly to the concrete or with a covering material bonded to the concrete. Such as other concrete, liquid floor hardener, waterproofing, dampproofing, membrane roofing, flooring, painting, and other coatings and finish materials, unless otherwise acceptable to the ENGINEER.

7. Curing formed Surfaces - Cure formed concrete surfaces, including the undersides of girders, beams, supported slabs and other similar surfaces by moist curing with the forms in place for the full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

8. Curing Unformed Surfaces

   a. Initially cure unformed surfaces, such as slabs, floor topping and other flat surfaces by moist curing, whenever possible.

   b. Final cure unformed surfaces, unless otherwise specified, by any of the methods specified above, as applicable.

   c. Final cure concrete surfaces to receive liquid floor hardener or finish flooring by use of moisture-retaining cover, unless otherwise acceptable to the ENGINEER.

9. Provide liquid curing-hardening compound as follows:

   a. Apply to horizontal surfaces when concrete is dry to touch by means of power spray, hand spray or hair broom in accordance with manufacturer's directions.

C. Temperature of Concrete during Curing

1. When the atmospheric temperature is 40°F and below, maintain the concrete temperature between 50°F and 70°F continuously throughout the curing period. When necessary, make arrangements before concrete placing for heating, covering, insulation or housing as required to maintain the specified temperature and moisture conditions continuously for the concrete curing period. Provide cold weather protections complying with the requirements of ACI 306.

2. When the atmospheric temperature is 80°F, and above, or during other climatic conditions which will cause too rapid drying of the concrete, make arrangements before the start of concrete placing for the installation wind breaks or shading, and for fog spraying, wet sprinkling or moisture-retaining covering. Protect the concrete continuously for the concrete curing period. Provide hot weather protections complying with the requirements of ACI 305.

3. Maintain concrete temperature as uniformly as possible and protect from rapid atmospheric temperature changes. Avoid temperature changes in concrete, which exceed 5°F in any one-hour and 50°F in any 24-hour period.

D. Protection from Mechanical Injury - During the curing period, protect concrete from damaging mechanical disturbances including load stresses, heavy shock, excessive vibration and from damage caused by rain or flowing water. Protect all finished concrete surfaces from damage by subsequent construction operations.

3.9 MISCELLANEOUS CONCRETE ITEMS

A. Filling-In - Fill-in holes and openings in concrete structures for the passage of work by other trades, unless otherwise shown or directed, after the work of other trades is in place. Mix, place and cure concrete as herein specified, to blend with in-place construction. Provide all other miscellaneous concrete filling shown or required to complete the work.

B. Curbs - Provide monolithic finish to interior curbs by stripping forms while concrete is still green and steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations - Provide machine and equipment bases and foundations as shown on the drawings. Set anchor bolts for machines and equipment to template at correct elevations, complying with certified diagrams or templates of the manufacturer furnishing the machines and equipment.

3.10 REMOVAL OF SHORES AND FORMS

A. Remove shores and reshore in a planned sequence to avoid damage to partially cured concrete. Locate and provide adequate reshoring to safely support the work without excessive stress or deflection.

Keep reshores in place a minimum of 15 days after placing upper tier, and longer if required, until the concrete has attained its required 28-day strength and heavy loads due to construction operations have been removed.

B. Formwork not supporting weight of concrete, such as sides of beams, walls, columns and similar parts of the work, may be removed after cumulative curing at not less than 50°F for 24 hours after placing concrete. Providing the concrete is sufficiently hard to not be damaged by form removal operations and provided curing and protection operations are maintained.

C. Formwork supporting weight of concrete, such as beam soffits, joints, slabs and other structural elements, may not be removed in less than 14 days and until concrete has attained design minimum compressive strength at 28 days. Determine potential

compressive strength of in place concrete by testing field-cured specimens representative of concrete location or members.

D. Form facing material may be removed four (4) days after placement only if shores and other vertical supports have been arranged to permit removal of form facing material without loosening or disturbing shores and supports.

E. Re-Use of Forms

Clean and repair surfaces of forms to be re-used in the work. Split, frayed, delaminated or otherwise damaged form facing material will not be acceptable. Apply new form coating compound material to concrete contact surfaces as specified for new formwork.

When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close all joints. Align and secure joints to avoid offsets. Do not use "patched" forms for exposed concrete surfaces, except as acceptable to the Architect.

No forming material will be allowed to be built permanently into exposed visible surfaces.

3.11 CONCRETE SURFACE REPAIRS

A. Patching Defective Areas

1. Repair and patch defective areas with cement mortar immediately after removal of forms but only when directed by the ENGINEER.

2. Cut out honeycomb, rock pockets, voids over 1/2-inch diameter and holes left by tie rods and bolts down to solid concrete but, in no case, to a depth of less than 1-inch. Make edges of cuts perpendicular to the concrete surface. Before placing the cement mortar, thoroughly clean, dampen with water and brush-coat the area to be patched with neat cement grout. Proprietary patching compounds may be used when acceptable to the ENGINEER.

3. For exposed-to-view surfaces, blend white Portland cement and standard Portland cement so that, when dry, the patching mortar will match the color of the surrounding concrete. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with the patching. Compact mortar in place and strike off slightly higher than the surrounding surface.

4. Fill holes extending through concrete by means of a plunger type gun or other suitable device from the least exposed face, using a flush stop held at the exposed face to ensure complete filling.

B. Repair of Formed Surfaces

1. Repair exposed-to-view formed concrete surfaces that contain defects, which adversely affect the appearance of the finish. Remove and replace the concrete having defective surfaces if the defects cannot be repaired to the satisfaction of the ENGINEER. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, and holes left by the rods and bolt; fins and other projections on the surface; and stains and other discolorations that cannot be removed by cleaning.

2. Repair concealed formed concrete surfaces that contain defects that adversely affect the durability of the concrete. If defects cannot be repaired, remove and replace the concrete having defective surfaces. Surface defects, as such, include cracks in excess of 0.01-inch wide, cracks or any width and other surface deficiencies which penetrate to the reinforcement or completely through non-reinforced sections, honeycomb, rock pockets, holes left by tie rods and bolts, and spalls except minor breakage at corners.

C. Repair of Unformed Surfaces

1. Test unformed surfaces, such as monolithic slabs, for smoothness and to verify surface plane to the tolerances specified for each surface and finish. Correct low and high areas as herein specified.

2. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness, using a template having the required slope. Correct high and low areas as herein specified.

3. Repair finished unformed surfaces that contain defects, which adversely affect the durability of the concrete. Surface defects, as such, include crazing, cracks in excess of 0.01-inch wide or which penetrate to the reinforcement or completely through non-reinforced sections regardless of width, spalling, popouts, honeycomb, rock pockets and other objectionable conditions.

4. Correct high areas in unformed surfaces by grinding, after the concrete has cured sufficiently so those repairs can be made without damage to adjacent areas.

5. Correct low areas in unformed surfaces during or immediately after completion of surface finishing operations by cutting out the low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Proprietary patching compounds may be used when acceptable to the ENGINEER.

6. Repair defective areas, except random cracks and single holes not exceeding 1-inch diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts, and expose reinforcing steel with at least

3/4-inch clearance all around. Dampen all concrete surfaces in contact with patching concrete and brush with a neat cement grout coating, or use concrete bonding agent. Place patching concrete before grout takes its initial set. Mix patching concrete of the same material to provide concrete of the same type or class as the original adjacent concrete. Place, compact and finish as required to blend with adjacent finished concrete. Cure in the same manner as adjacent concrete.

7. Repair isolated random cracks and single holes not over 1 inch in diameter by the dry-pack method. Groove the top of cracks and cut out holes to sound concrete and clean off dust, dirt and loose particles. Dampen all cleaned concrete surfaces and brush with a neat cement grout coating. Place dry-pack before the cement grout takes its initial set. Mix dry-pack, consisting of one part Portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched areas continuously moist for not less than 72 hours.

8. For repair of existing unformed surfaces, mechanically remove all lose concrete as required to expose sound aggregate. Clean concrete surfaces to achieve a contaminate free, open textured surface. Square cut or under cut perimeter to minimum depth as specified by the repair mortar manufacturer. Remove all lose concrete around the exposed steel and hand tool or blast clean all portions of rebar with visible rust to near white metal finish. If half of the diameter of the reinforcing steel is exposed, chip out behind the reinforcing to a 1/2-inch minimum depth. Splice new reinforcing steel to existing where corrosion has depleted the cross-section area by 25%. Apply a corrosion inhibitor/primer/bonding agent to all exposed rebar and other steel components and to concrete surfaces to be repaired per manufacturer's requirements, such as Sika Armatec 110 . Apply a polymer-modified, cement-based, repair mortar, trowel applied as specified by the manufacturer, such as Sika MonoTop 615.

9. Repair methods not specified above may be used subject to the acceptance of the ENGINEER.

3.12 QUALITY CONTROL TESTING DURING CONSTRUCTION

A. The CONTRACTOR will engage a special inspector/testing laboratory to perform all tests and to submit test reports to the ENGINEER and the OWNER.

B. Concrete shall be sampled and tested for quality control during the placement of concrete, as follows:

1. Sampling Fresh Concrete - ASTM C172, except modified for slump to comply with ASTM C94.

2. Slump - ASTM 143; one (1) test for each concrete load at point of discharge; and one (1) for each set of compressive strength test specimens.

3. Air Content - ASTM C231, pressure method; one (1) for each set of compressive strength test specimens.

4. Compression Test Specimen - ASTM C31; one (1) set of four (4) standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.

5. Concrete Temperature - Test hourly when air temperature is 40°F and below, and when 80°F and above; and each time a set of compression test specimens is made.

6. Compressive Strength Tests - ASTM C39; one (1) set for each 100 cubic yards or fraction thereof, of each concrete class placed in any one (1) day or for each 5,000 square feet of surface area placed; one (1) specimen tested at seven (7) days, two (2) specimens tested at 28 days, and one (1) specimen retained in reserve for later testing if required.

    a. When the frequency of testing will provide less than five (5) strength tests for a given class of concrete, conduct testing from at least five (5) randomly selected batches or from each batch if fewer than five (5) are used.

    b. When the total quantity of a given class of concrete is less than 50 cubic yards, the strength tests may be waived by the ENGINEER if, in his judgment, adequate evidence of satisfactory strength is provided.

    c. If required by the building official, perform strength tests of cylinders cured under field conditions. Field cured cylinders shall be taken and molded at the same time and from the same samples as the laboratory cured test cylinders. When the strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.

C. Report test results in writing to the ENGINEER and the CONTRACTOR on the same day that tests are made. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of CONTRACTOR, name of concrete supplier and truck number, name of concrete testing service, concrete type and class, location of concrete batch in the structure, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength and type of break for both 7-day tests and 28-day tests.

D. Additional tests - The testing service will make additional tests of in-place concrete when test results indicate the specified concrete strengths and other characteristics

have not been attained in the structure, as directed by the ENGINEER. The testing service shall conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42, or by other methods as directed. CONTRACTOR shall pay for such tests conducted, and any other additional testing as may be required, when unacceptable concrete is verified.

END OF SECTION

SECTION 26 42 01

CORROSION MONITORING SYSTEM FOR DUCTILE IRON PIPE

PART 1 GENERAL

1.1 DESCRIPTION

A. This section covers the work necessary to furnish and install a corrosion monitoring system on buried ductile iron water pipelines and appurtenances complete, including pipeline isolation joints (insulated flanges), bonds on the pipeline, valves and fittings between isolation joints to form an electrically continuous pipeline, and corrosion monitoring test stations.

B. This section also covers the work necessary to install a reference electrode, monitoring coupons, and additional anodes to replace those previously installed and connected to existing cathodic protection test stations located in the Right-of-Way near the intersection of West Avenue and Walnut Street, as shown on Drawings (Sheet C-5).

C. The CONTRACTOR shall furnish all labor, equipment and materials as required for the complete installation of the corrosion monitoring system and cathodic protection specified herein. The corrosion monitoring system and cathodic protection shall include the appropriate pipe bonding, fitting bonding, anodes, backfill material, test stations, cables, fittings and all necessary items of equipment and materials for the completed system. It is the intent of these Specifications that the CONTRACTOR furnish and install all materials and equipment and provide all labor required and necessary to complete the work shown on the drawings or specified herein and elsewhere, and all other work items not specifically mentioned but reasonably inferred for a complete installation.

1.2 GENERAL

Like items of materials provided hereunder shall be the end product of one manufacturer to achieve standardization for appearance, maintenance, and replacement.

1.3 DEFINITIONS

A. Ferrous Metal Pipe/Fitting: Any pipe and/or fitting made of steel or iron and pipe containing steel or iron as a principle structural material, except reinforced concrete.

B. Lead, Lead Wires, Fitting Bonds, Cable: Insulated copper conductor; the same as wire.

C. AWG American Wire Gauge

D. NACE National Association of Corrosion Engineers (NACE International)

1.4 CONTRACTOR SUBMITTALS

A. The CONTRACTOR shall submit for approval the following items:

1. A complete list of equipment and material to be furnished, including name and manufacturer, catalog number, size, finish and other pertinent data necessary for proper identification and to determine conformance with Specifications.

2. A certified compliance report with an independent laboratory analysis the galvanic anode material and backfill material meets the requirements of this specification. Also include a detail of anode cable to anode connection.

3. Certification by the cable manufacturer-covering conformance of cable insulation to designated specification.

4. Thermite welder's certification. See Item 1.5.F of this Section.

5. Joint bond tester's certification. This is the person that performs the test prior to burial, see Item 1.5.F of this Section. The Corrosion Engineer or Cathodic Protection Specialist must perform the test after burial.

6. Resume for Corrosion Engineer or Cathodic Protection Specialist.

7. Test plan to be used to verify electrical continuity of piping network. OWNER approval of the test plan is required prior to performing field testing.

B. Upon completion of the cathodic protection system, and as a condition of its acceptance, deliver, for use by the OWNER and ENGINEER, four complete bound sets of the following information:

1. Components of cathodic protection system, including copies of all product data and list of cathodic protection equipment suppliers with addresses and phone numbers;

2. Copies of all test reports, including test forms, general record keeping, and interpretation of results;

3. Copy of complete set of drawings showing where all anodes, fitting bonds, and test stations are located.

1.5 QUALITY CONTROL

A. A qualified Corrosion Engineer specializing in cathodic protection or a Cathodic Protection (CP) Specialist certified with the National Association of Corrosion Engineers shall perform all testing on the cathodic protection system.

B. It is to the CONTRACTOR's benefit to perform continuity tests on all bonded pipe and fittings throughout each sequence of construction.

C. Continuity Tests

1. All bonded buried and submerged pipe and fittings shall be tested by the CONTRACTOR for electrical continuity after all connections have been made. The approved Corrosion Engineer or CP Specialist shall conduct testing. The Engineer or CP Specialist shall be subject to approval by the ENGINEER.

2. If electrical continuity is not achieved as required, the CONTRACTOR shall complete the necessary repairs and retest to prove electrical continuity. Records of all test results, including test locations and equipment used for testing shall be submitted to the ENGINEER, prior to burial, for evaluation and acceptance or recommendations.

D. Isolation Joints

1. All isolation joints shall be tested and recorded under the supervision/consultation of the Corrosion Engineer or CP Specialist, prior to burial.

2. All of the isolation joints shall be tested and recorded, by the Corrosion Engineer or CP Specialist during the final testing.

E. Final Tests

The CONTRACTOR shall install all test stations and additional materials to existing test stations as shown on the drawings and specified herein. After installation of all corrosion monitoring facilities and additional materials to existing test stations is complete, the Corrosion Engineer or CP Specialist shall test to assure that all Specifications and Drawings have been complied with and the anodes installed at the existing test station provides additional protection on the existing pipeline. After completion of all tests and inspections, a detailed report describing any deficiencies detected will be submitted to the CONTRACTOR. The CONTRACTOR shall make all repairs necessary to correct these deficiencies at his own expense. The system shall then be retested prior to Final Acceptance. The CONTRACTOR shall pay for all retests made necessary by the corrections.

F. Thermite Weld Qualifying

Skilled personnel who have had adequate experience in the methods and materials to be used shall do all thermite welding. The Corrosion Engineer or CP Specialist prior to commencing work on the pipeline shall qualify thermite welder personnel. Equipment similar to those used in the work shall be used in qualification tests. The CONTRACTOR shall furnish all material and bear the expense of qualifying thermite welders and bond tester. The Corrosion Engineer or CP Specialist shall provide a photograph and name of all personnel that is certified to perform the thermite welding and bond testing to the ENGINEER for approval.

PART 2 PRODUCTS

2.1 GENERAL

A. All materials shall conform to the requirements set forth herein or as designated on the drawings, unless otherwise specified. All materials must be new, free from defects and shall be of the best commercial quality for the purpose specified. All necessary items and accessories not shown on the drawings or specified herein, but which are required to fully carry out the specified intent of the work, shall be furnished without additional cost to the ENGINEER.

B. The CONTRACTOR is responsible to coordinate material compatibility. All components and materials may not be supplied by the same manufacturer; therefore, the CONTRACTOR shall supply the necessary dimensions and materials characteristics to the respective material supplier to insure the finished product is free of defects and irregularities that could occur from unmatched components.

C. The use of a manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration desired only. Products of other manufacturers will be considered in accordance with the contract documents.

2.2 MATERIAL SUPPLIERS

Suppliers listed below can usually supply the types of materials specified in this section. Alternate suppliers will be considered, subject to approval of the ENGINEER. The cities and phone number listed is the manufacturer’s nearest representative office to the project site, that we know of; these offices can inform the CONTRACTOR if they have anyone closer.

- Cathodic Protection Engineering, West Linn, OR; 503/720-3220
- Corrpro/ Aegion, Hayward, CA; 510/614-8800
- Farwest Corrosion Control, Mukilteo, WA; 425/290-8832
- Mesa Products, Mukilteo, WA; 425/903-4850
- Matcor, Inc., Houston, TX; 281/558-2600

2.3 GALVANIC ANODES

A. High-Potential Magnesium Alloy:

1. Composition:

Aluminum	0.01% maximum
Manganese	0.50% to 1.300%
Zinc	0
Silicon	0.05% maximum
Copper	0.02% maximum
Nickel	0.001% maximum
Iron	0.03% maximum
Total Impurities	0.30% maximum, total
Magnesium	Remainder

2. Dimensions:

a. For Replacement of Anodes Connected to Existing Test Stations located near the Intersection of West Avenue and Walnut Street (See Sheet C-5):

Length	30 inches minimum
Bare Weight	48 pounds minimum

3. Acceptable Anodes: High potential magnesium anodes shall comply with Dow Galvomag, or approved equal.

B. Compliance Statement: Furnish an independent laboratory analysis guaranteeing that all anodes supplied meet all the requirements of this Specification.

C. Anode Wire: Supply each anode with No. 12AWG solid copper wire with THHN insulation, 10 feet long, minimum.

D. Wire-to-Anode Connection: Manufacturer's standard. The anode connection shall be stronger than the wire.

E. Backfill Composition:

Ground Hydrated Gypsum	75 percent
Powdered Wyoming Bentonite	20 percent
Anhydrous Sodium Sulfate	5 percent

1. Backfill: Backfill shall have a grain size so that 100 percent is capable of passing through a 20-mesh screen and 50 percent will be retained by a 100-mesh screen. The backfill mixture shall be thoroughly mixed and firmly packaged around the galvanic anode within the cloth bag or cardboard tube by means of adequate vibration. The complete packaged galvanic anode shall weigh a minimum of 2.5 times the bare anode weight. The quantity of backfill shall be sufficient to cover all surfaces of the anode to a depth of 1 inch.

2. Packaging and Shipping: Provide electrode packaged in a plastic or heavy paper bag of sufficient thickness to protect the electrode, backfill, and cloth bag during normal shipping and handling.

2.4 BOND WIRES

General: fitting bond wires shall be no. 2 single-conductor, stranded copper wire with 600-volt hmwpe insulation. Supply all fitting bonds complete with a formed copper sleeve on each end of the wire.

2.5 CATHODIC PROTECTION TEST STATION

A. Flush Mounted Test Station (Standard):

1. Test Box: Concrete body cast with a cast iron ring, with a minimum weight of 55 pounds and minimum dimensions of 8-inch inside diameter and 12-inches long. Furnish extensions as required to penetrate concrete surfaces by 4-inches minimum. Furnish with a 12-pound cast iron lid with the letters “TS” or words “Test Station” cast into the lid.

2. Terminal Block: Plastic or glass-reinforced, ¼- inch thick laminate terminal board with minimum dimensions of 5-inches by 6-inches. Furnish terminal block with a minimum of nine (9) terminals. Terminal nuts and studs shall be ¼-inch with double nuts for securing the studs to the terminal board. Terminal nuts, studs, flat and lock washers shall be nickel-plated brass, bronze, or Series 300 stainless steel.

3. Shunt: Shunts for test stations shall be 0.01 ohm minimum 6 amp capacity; Holloway Type RS manganin wire; Cott (yellow); Tinker & Rassor (yellow); or approved equal. Furnish the required amount (0 to 3) for each test station, see Drawings.

4. Buss Bar: Buss bars shall be nickel-plated braze, bronze, or series 300 stainless steel, length long enough to connect two terminals, and have a minimum of 6 amp capacity. Furnish the required amount (0 to 3) for each test station, see Drawings.

5. Magnetic Switch:

    a. The magnetic switch to be installed on terminal boards of new test stations shall be model SM-ADJ as manufactured by Electrochemical Devices, Inc., or approved equal. The magnetic switch shall have the following electrical specifications:

    b. Switching Current: 0.5 amps

    c. Carry current: 1.0 amp

    d. Switching Voltage: 175 volts

    e. Breakdown voltage: min. 200 VDC

    f. Contact resistance: 150 mohm

    g. Operating temp.: -40F to 260F

2.6 TEST STATION WIRES

A. Wire: Single-conductor, No. 8 and No. 12 AWG stranded copper with 600-volt THWN, or THHN insulation (test stations) and single-conductor.

B. Insulation Color:

1. Anode – black
2. New Pipe at insulator – white
3. Existing Pipe at insulator – blue
4. Coupon – purple, with one set having red tape
5. Reference electrode – yellow

2.7 PERMANENT REFERENCE ELECTRODES

Prepackaged Copper/Copper Sulfate Electrodes (CSE):

A. Material: Permanent type copper-copper sulfate reference electrode suitable for direct burial with a minimum design life of 30 years.

B. Wire: No. 12 AWG stranded copper wire with yellow, 600-volt THWN, OR THHN insulation. The wire shall be sufficient length to reach the test station plus 10-feet and

attached to the electrode core by the manufacturer's standard connection. Connection shall be stronger than the wire.

C. Backfill: A mix that retains moisture and minimizes migration of contaminants from the surrounding soil, in permeable cloth bag, or equal.

D. Packaging: Provide electrode packaged in a plastic or heavy paper bag of sufficient thickness to protect the electrode, backfill, and cloth bag during normal shipping and handling.

E. Acceptable Reference Electrodes: GMC model CU-1-UG; or equal.

2.8 CATHODIC PROTECTION MONITORING COUPONS

A. Provide coupons, steel or ductile iron to match the pipe material type. The coupon shall have 2 wires connected with a silver soldered potted connection, and with a minimum length of 25 feet.

B. Acceptable Monitoring Coupons: MC Miller IR-Free coupons or approved equal.

2.9 THERMITE WELD MATERIALS

A. General: Thermite weld materials shall consist of wire sleeves, welders, and weld cartridges according to the weld manufacturer's recommendations for each wire size and pipe or fitting size and material. All welding materials and equipment shall be the product of a single manufacturer. Interchanging materials of different manufacturers will not be acceptable.

B. Molds: Graphite. Ceramic "One-Shot" molds will not be acceptable.

C. Cartridges: Cast iron thermite weld cartridges shall be used for all cast and ductile iron pipe and fittings. Maximum cartridge size shall be 25 grams for steel and 32 grams for cast and ductile iron materials, respectively.

D. Welders and Cartridges: Provide the thermite weld materials for attaching copper wire to the pipe material using the appropriate types recommended by manufacturer.

E. Acceptable Suppliers: Erico Products Inc. (Cadweld), Cleveland, OH; Continental Industries, Inc. (Thermo- weld), Tulsa, OK; or equal.

2.10 THERMITE WELD COATING MATERIALS

A. Thermite weld connections shall be coated with the following materials as per manufacturer's recommendations.

1. Royston Handy Cap IP

2.11 WIRE CONNECTORS

A. Test Station: One-piece, tin-plated crimp-on lug connector as manufactured by Burndy Co., Thomas and Betts, or equal.

B. All test station fastening hardware shall be stainless steel.

2.12 INSULATING JOINTS

A. Insulating Joints: Flanges or couplings.

1. Complete assembly shall have an ANSI rating equal to or higher than that of the joint and pipeline.

2. Materials shall be resistant for the intended exposure, operation temperatures, and products in the pipeline.

B. Flange Insulating Kits:

1. Gaskets: Gaskets shall be full face and conform to ANSI B16.21, suitable for the operating and test pressures of the pipe system. Gaskets shall be non-asbestos and non-phenolic. Gaskets shall be Garlock Gylon 3505, or approved equal.

2. Insulating Sleeves: Full-length fiberglass reinforced epoxy (NEMA G-10 grade).

3. Insulated Washers: Fiberglass reinforced epoxy (NEMA G-10 grade).

4. Steel Washers: Plated, hot-rolled steel, 1/8-inch thick.

5. Manufacturers:

a. Pacific Seal, Inc., Burbank, CA.
b. Central Plastics Co., Shawnee, OK.

C. Flexible Insulated Couplings: Per manufacturer's recommendations

1. Manufacturers:

a. Dresser Industries, Inc., Bradford, PN.
b. Romac Industries, Inc., Bothell, WA

2.13 ELECTRICAL TAPE

Linerless rubber high-voltage splicing tape suitable for moist and wet environments, such as Scotch 130C and Scotch 88, as manufactured by 3M Products, or equal.

2.14 WIRE INSULATION REPAIR

Wires shall be handled with care. Splices for damage to the wire insulation shall be required by spirally wrapping (50 percent overlay, minimum) with two coats of high-voltage rubber splicing tape and two layers of vinyl electrical tape. Wire splices shall be made with suitable sized compression connectors as specified under PRODUCTS, this section, or mechanically secured and soldered with rosin cored 50/50 solder. The ENGINEER shall approve all splices.

2.15 WAX TAPE COATING AND POLYETHYLENE ENCASEMENT FOR DI PIPE AND FITTINGS

See Specification Section 33 11 10, *Water Utility and Transmission Piping* for requirements. All ductile iron pipe, ductile iron fittings, and valves for all proposed pipelines require wax tape coating and polyethylene encasement in accordance with the drawings and specifications.

2.16 PVC TAPE COATING FOR BURIED BRASS AND GALVANIZED PIPING

A. PVC Tape - Premium vinyl electrical tape 8.5 mil thick, such as 3M Scotch Super 88, or approved equal.

PART 3 EXECUTION

3.1 GENERAL

A. The installation of the facilities herein specified and described shall conform to the latest applicable rules as set forth herein. Equipment or materials damaged in shipment or during installation shall be replaced at no additional expense to the Owner.

B. All materials and equipment associated with fitting bonding, test stations, and anodes, as shown and specified herein shall be furnished and installed by the CONTRACTOR. The ENGINEER shall review any changes in design or method of installation of an item as specified

C. All materials, workmanship and installation shall conform to all requirements of the legally constituted authority having jurisdiction. These authorities include, but are not limited to, the National Electric Code, General Construction Safety Orders of the Industrial Accident Commission; and all other applicable State, County, or City codes and regulations

D. Whenever the requirements of the specifications or drawings exceed those of the codes or manufacturer's instructions, the requirements of the specifications or drawings shall prevail. Where a larger size or better grade of material or a higher standard of workmanship is required, the most stringent requirement shall apply. Nothing in the Drawings or Specifications is to be construed to permit work not

conforming to these regulations and codes. The CONTRACTOR shall be responsible for obtaining any required permits and inspections.

E. All materials and equipment to be used in construction shall be stored in such a manner to be protected from detrimental effects from the elements. If actual storage cannot be affected, materials and equipment shall be stacked well above ground level and protected from the elements as appropriate.

3.2 ANODE STORAGE AND HANDLING

A. Protect against weather, condensation, and mechanical damage. Immediately remove from site all mechanically damaged anodes.

3.3 GALVANIC ANODE INSTALLATION

A. General:

1. Install galvanic anodes a minimum of 5 foot below the pipe invert for ductile iron pipe installations in native soil. Provide a minimum anode spacing of 5 feet from unprotected pipelines. Also provide a minimum spacing of 5 feet between anodes.

2. For galvanic anodes packaged in plastic bags, the plastic bag must be removed prior to installation. If in paper bag, confirm the paper bag does not have a plastic liner. If it does the plastic bag must be removed so you can see the cloth bag or carboard tube the anodes are installed in.

3. A minimum of 10 gallons of water to be poured over the anode, just prior to backfilling.

4. Earth backfill around each anode shall be thoroughly compacted to a point 1 foot above the anode. Backfill material around each anode shall be native soil free of roots, organic matter, trash, and rocks. Stop backfill at specified grade for pipe trench to allow for placing of the select backfill for the pipe bedding.

5. All anode wires shall be buried a minimum of 36 inches below finish grade. Wires shall be handled with care. Splices or damage to the insulation on any wire shall be repaired in accordance with WIRE INSULATION REPAIR, this section.

B. Existing Test Stations near Intersection of West Avenue and Walnut Street (Sheet C-5): Install up to 4 new anodes at existing cathodic protection test stations located near the intersection of West Avenue and Walnut Street. The Contractor's CP Specialist or CP Engineer shall take measurements at existing test stations to confirm the number of anodes to install to provide protection. Wires to existing test station shall be repaired as required if damaged during planned excavations in their vicinity.

3.4 PIPE BONDING

A. Electrically bond the joints of buried ductile iron pipe, including fittings, manhole piping, and restrained joints, except joints specified to be threaded, welded, or insulated.

B. Install two joint bond wire assemblies at each joint that requires bonding.

C. Use thermite weld process for electrical connection of wires to pipe and fittings.

D. Test each bonded joint for continuity.

3.5 TEST STATION INSTALLATION

A. The general locations of the test stations are shown on the Drawings. The CONTRACTOR shall determine the location of the test stations based on actual site conditions and as approved by the ENGINEER.

B. Test stations shall be located off the roadway, location as approved by the ENGINEER, where shown on the Drawings.

C. Test wires shall be attached to the pipe as specified under WIRE CONNECTIONS, this section.

D. Locate flush-mounted test station behind curb where applicable.

E. The pipe, anode, and reference electrode wires shall be buried a minimum of 36 inches below finished grade.

F. Wire connections to test station terminals shall be with crimp-on spade lug terminals, except where solid wire is specified or terminal strips with tubular clamps are used.

3.6 REFERENCE ELECTRODES

A. Remove plastic or paper wrapper and soak reference electrode for minimum of 15 minutes prior to installation. Place reference electrode a maximum of one-half foot from pipeline. Wire shall be buried a minimum of 36 inches below finished grade.

3.7 MONITORING COUPONS

A. Place the monitoring coupons a maximum of one-half foot from pipeline. Wire shall be buried a minimum of 36 inches below finished grade.

3.8 WIRE CONNECTIONS

A. The electrical connections of copper wire to steel, ductile, and cast iron surfaces shall be by the thermite weld method. Observe proper safety precautions, welding

procedures, thermite weld material selection, and surface preparation as recommended by the welder manufacturer. Assure that the pipe or fitting wall thickness is of sufficient thickness that the thermite weld process will not damage the integrity of the fitting wall or protective lining.

B. Before the connection is made, the surface shall be cleaned to bare metal by making a 2-inch by 2-inch window in the coating, and then filing or grinding the surface to produce a bright metal finish. All grinding shall be with a vitrified type-grinding wheel; the use of a resin, rubber, or shellac-impregnated type grinding wheel will not be acceptable. The prepared metal surface shall be dry.

C. Wire sleeves shall be installed on the ends of the wires before welding to the metal surface. Thermite welding shall be performed in strict accordance with the manufacturer's written instructions. After the weld connection has cooled, remove slag and physically test wire connection by hitting with a hammer while pulling on the wire at a 45^{o} angle; remove and replace any defective connections.

D. Coat wire connection with a thermite weld cap.

3.9 WAX TAPE COATING AND POLYETHYLENE ENCASEMENT FOR DI PIPE AND FITTINGS

A. See Specification Section 02620, *Ductile Iron Pipe, Fittings and Special Items* and Section 02640, *PVC Pressure Pipe, Fittings & Special Items* for requirements. All ductile iron pipe, ductile iron fittings, and valves for all proposed pipelines require wax tape coating and polyethylene encasement in accordance with the drawings and specifications.

3.10 PVC TAPE WRAP FOR BURIED BRASS AND GALVANIZED PIPING

A. All buried saddle taps and buried brass piping shall be completely coated PVC tape wrap system as described herein. PVC tape to be applied with a suitable primer, as required. The spirally-wrapped PVC tape shall have a nominal minimum thickness of 17 mils, consisting of either one layer of 17-mil tape or two separate layers of 8.5-mil tape.

3.11 SURFACE RESTORATION

A. Surface restoration shall be as approved by ENGINEER and as detailed within these Specifications.

3.12 FIELD TESTING

A. Test Equipment: Before construction begins, obtain the test equipment necessary for testing:

1. Model RF-IT radio frequency insulator tester, as manufactured by Tinker and Rasor, or equal

2. An Amprobe Model HD-110C, Fluke Model 170, or equal

3. Activating magnet Model SM-MAG, 5/8 inch diameter by 2 inch long, as manufactured by Electrochemical Devices, Inc.

4. Two Model 6B Copper-Copper Sulfate reference electrodes, as manufactured by Tinker and Rasor, or equal

5. 1 quart of copper sulfate anti-freeze solution

6. ½-pound of copper sulfate crystals.

B. Store test equipment at the project site and maintain in accurately calibrated, working condition. The test equipment shall be available to the ENGINEER for testing purposes. Upon completion of the project, the test equipment listed above shall be turned over to the OWNER in clean, accurate, and fully functional condition, along with operation manuals, test wires, and cases supplied with the equipment.

C. Electrical Continuity Testing – Prior to Backfilling

Furnish all necessary equipment and materials and make all electrical connections to the pipe as required to test continuity of bonded joints.

Conduct a continuity test on all buried joints that are required to be bonded. Test the electrical continuity of joint bonds after the bonds are installed but before backfilling of the pipe.

The CONTRACTOR's Cathodic Protection Specialist shall monitor the test of each bonded joint prior to burial. The CONTRACTOR shall provide the name and certificate of the person that will be performing the testing prior to the start of the project.

The CONTRACTOR shall test electrical continuity of completed joint bonds using either a digital low resistance ohmmeter or by the Calculated Resistance Method at the CONTRACTOR's option. The equipment and test procedures for the two methods are described herein.

1. Digital Low Resistance Ohmmeter Method:

    a. Furnish the following equipment and materials:

        1) One Biddle Model 247001 digital low resistance ohmmeter; or equal

2) One set of duplex helical current and potential hand spikes, Biddle Model No. 241001, cable length as required; or equal

3) One calibration shunt rated at 0.001 ohms, 100 amperes, Biddle Model No. 249004, or equal

b. Test Procedure: Measure the resistance of joint bonds with the low resistance ohmmeter in accordance with the manufacturer's written instructions. Use the helical hand spikes to contact the pipe on each side of the joint, without touching the thermite weld or the bond. The contact area shall be cleaned to bright metal by filing or grinding and without any surface rusting or oxidation. Record the measured joint bond resistance on test form described herein. Repair any damaged pipe coating in accordance with WIRE CONNECTIONS, this section.

2. Calculated Resistance Method:

a. Furnish the flowing equipment and materials:

1) One dc ammeter (meter or clamp-on) with full scale reading of 100 amperes and a minimum resolution of 1 ampere or a 100-ampere shunt with a voltmeter as specified herein.

2) One high-resistance electronic voltmeter with a dc low range of 200 millivolt full scale to a dc high range of 20 volts full scale and capable of a minimum resolution of 1 millivolt (two voltmeters are required if a shunt is used for item a. above).

3) One knife switch, safety switch, or time controlled relay suitable for test current.

4) Two electrical probes for the voltmeter.

5) Insulated wire suitable for carrying the test current, length as required.

6) One dc power supply with a steady capacity of 50 amperes minimum; storage batteries are not an acceptable power supply.

b. Test Procedure:

1) The test setup shall be as shown at the end of this section. Current wire connections shall be either tightly clamped or thermite welded to the pipe at the CONTRACTOR's option. Wire size shall be determined by the CONTRACTOR and shall be sized for the test current, and shall not exceed 1,000 feet in length.

a) Apply a minimum direct current of 50 amperes.

b) Measure the voltage drop across each joint with a voltmeter by contacting the pipe on each side of the joint. Voltmeter connections to the bond wire or thermite welds will not be acceptable.

c) Measure the current applied to the test span and the voltage drop across the joint simultaneously.

d) Record the measured voltage drop and current for each joint on the test form described herein and calculate the bond resistance in accordance with the following formula:

R = E/I

Where:

R = Resistance of the joint bond, in ohms
E = Measured voltage drop across the joint, in volts
I = Test current applied to the pipe test span, in amperes

D. Joint Bond Acceptance:

1. Joint bond resistance shall be less than or equal to the maximum allowable bond resistance values shown in the below table.

Joint Type	Max. Allowable Resistance 2 Bonds/Joint
Push-On or Mechanical	0.000169 ohm
Flexible Coupling	0.000219 ohm

(The above resistance considers 18- and 24-inch long bond wires, respectively)

2. The CONTRACTOR shall replace any joint bond, which exceeds the allowable resistance or add additional joint bonds, at his option. Replacement joint bonds and/or additional bonds shall be retested for compliance with the specified bond resistance.

3. The CONTRACTOR shall repair defective joint bonds discovered during the energizing and testing procedure.

E. Record Test of Each Bonded Pipeline:

1. Description and location of the pipeline tested
2. Starting location and direction of test
3. Date of test

4. Joint type
5. Test current and voltage drop across each joint and calculated bond resistance (Calculated Resistance Method only)
6. Measured joint bond resistance (Digital Low Resistance Ohmmeter method only)

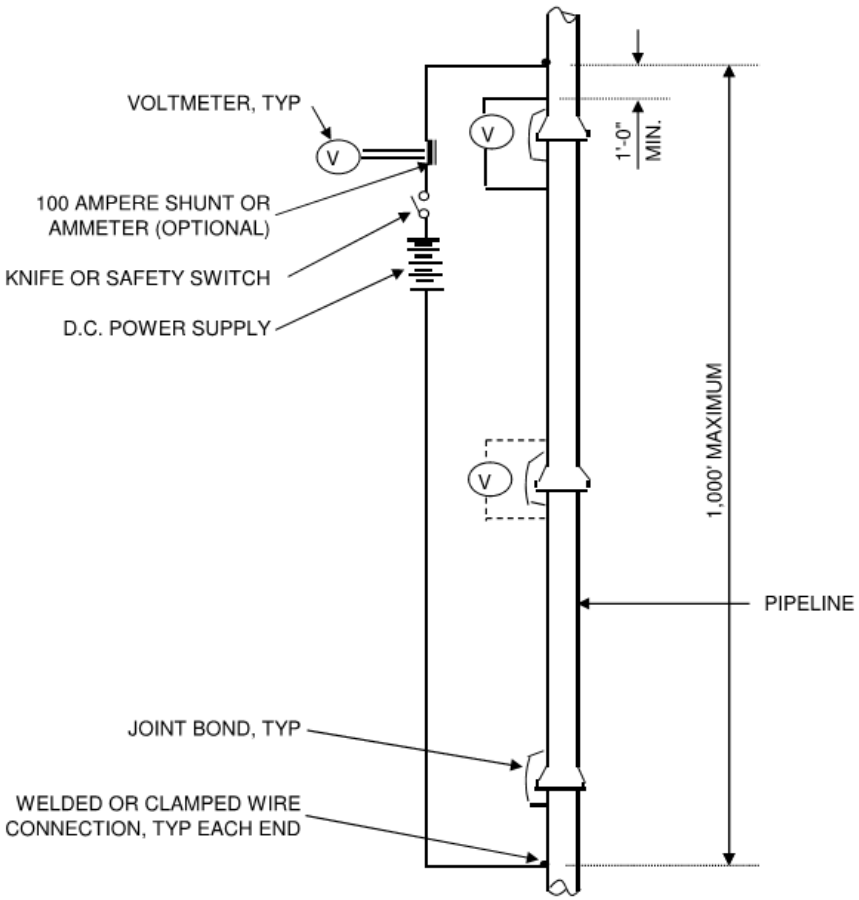
F. Insulated Joint Testing: Test each joint after assembly with the insulator tester in accordance with the manufacturer's written instructions. Cathodic Protection Specialist shall monitor the test. Replace damaged or defective insulation parts. Provide the ENGINEER with 3 days advance notice before beginning tests.

G. Testing:

1. Energizing and Testing: After the installation of the cathodic protection system is complete, the CONTRACTOR's Corrosion Engineer or CP Specialist will make sufficient tests throughout the network of protected casing, piping, fittings, etc. to ensure proper installation of the corrosion monitoring and cathodic protection system. Upon completion of such tests, the Corrosion Engineer or CP Specialist who conducted the tests shall tabulate the data recorded. The CONTRACTOR at his sole expense shall correct any construction defects located during energizing and testing.

2. After construction is complete, the Corrosion Engineer or CP Specialist shall test the pipeline to ensure proper installation of the fitting bonds, test stations, and reference cells. Any construction defects identified during testing shall be located and corrected by the CONTRACTOR. Provide the ENGINEER with 3 days advance notice before beginning tests. All test data shall be recorded and submitted to the ENGINEER.

3. (See Joint Bond Continuity Test Schematic following this section)



JOINT BOND CONTINUITY TEST SCHEMATIC

END OF SECTION

SECTION 31 05 13

SOILS FOR EARTHWORK

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes range of soil and subsoil materials intended to be referenced by other sections, generally for fill and grading purposes. Materials are indicated by "Type" to assist in referencing from other sections and on Drawing notes.

B. Section includes:

1. Subsoil materials.
2. Topsoil materials.

1.2 RELATED SECTIONS

A. Section 31 05 16 - Aggregates for Earthwork.

B. Section 31 10 00 – Site Clearing.

C. Section 31 22 13 - Rough Grading.

D. Section 31 23 16 – Excavation.

E. Section 31 23 17 - Trenching.

F. Section 31 23 18 – Rock Removal.

1.3 REFERENCES

A. American Association of State Highway and Transportation Officials:

1. AASHTO T99 - Standard Specification for Moisture-Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in.) Drop.

B. ASTM International:

1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).

2. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).

3. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Materials Source: Submit name of imported materials source.

C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. Furnish materials of each type from same source throughout the Work.

B. Soil Testing:

1. Soil sampling and testing to be completed by an independent laboratory approved by the Engineer.

2. Frequency of testing shall be determined by the Engineer.

3. All soil testing shall be paid for by the Contractor.

C. Compaction Tests:

1. Maximum density at optimum moisture content determined by ASTM D698 (AASHTO T99).

2. In-place density in accordance with Nuclear Testing Method, ASTM D6938.

D. Soil Classification: All imported materials shall be classified in accordance with ASTM D2487.

PART 2 PRODUCTS

2.1 SUBSOIL MATERIALS

A. Subsoil Type S1, Select Native Material:

1. Select earth obtained from on-site excavations approved for use by Engineer.

2. Graded.

3. Free of peat, humus, vegetative matter, organic matter and rocks larger than 6 inches in diameter.

4. Processed as required to be placed in thickness as prescribed and at the optimum moisture content to obtain level of compaction required by these specifications.

B. Subsoil Type S2, Imported Fill Material:

1. Imported earth approved for use by Engineer.
2. Meeting the requirements of Subsoil Type S1.

2.2 TOPSOIL MATERIALS

A. Topsoil Type TS1, Select Native Topsoil Material:

1. Top 6 - 12 inches of existing soil containing organic matter.

2. Engineer decision shall be final as to determination of what material is topsoil quality.

3. Graded.

4. Free of roots, rocks larger than 1/2 inch subsoil, debris, large weeds and foreign matter.

a. Screening: Single screened.

B. Topsoil Type TS2, Imported Topsoil Material:

1. Imported borrow.

2. Friable loam.

3. Reasonably free of roots, rocks larger than 1/2 inch, subsoil, debris, large weeds, and foreign matter.

a. Screening: Single screened.

4. Acidity range (pH) of 5.5 to 7.5.

5. Containing minimum of 4 percent and maximum of 25 percent inorganic matter.

2.3 SPOILS

A. All excess material not suitable or not required for backfill and grading shall be hauled off site and disposed of at a location provided by the Contractor and approved by the Engineer.

B. Make arrangements for disposal of the material at no additional cost to the Owner.

C. Landfill permit to be obtained by the Contractor and provided to Engineer prior to commencement of disposal.

2.4 SOURCE QUALITY CONTROL

A. Testing and Analysis of Subsoil Material: Perform in accordance with ASTM D698 (AASHTO T99).

B. When tests indicate materials do not meet specified requirements, change material or vary compaction methods and retest. Additional testing shall be completed and paid for by the Contractor with no reimbursement by the Owner.

C. Furnish materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.1 EXCAVATION

A. Excavate material of every nature and description to the lines and grades as indicated on the Drawings and/or as required for construction of facilities.

B. Site within clearing limits shall be stripped of topsoil as required to obtain additional topsoil necessary to complete Work indicated in the Drawings or as specified.

C. When practical, do not excavate wet top soil.

D. Stockpile excavated material meeting requirements for subsoil materials and topsoil materials.

E. Remove excess excavated subsoil and topsoil not intended for reuse from Site.

F. Remove excavated materials not meeting requirements for subsoil materials and topsoil materials from Site.

3.2 STOCKPILING

A. Stockpile soils at locations shown in the Drawings or at locations as approved by Engineer for redistribution as specified.

1. Site may not have sufficient area to stockpile excavated material that will be required for fill later in the project. If additional stockpile area is required to complete the Project on schedule, arrange off-site stockpile areas.

2. No additional payments will be made for stockpiling excavated materials off-site.

B. Stockpile in sufficient quantities to meet Project schedule and requirements.

C. Separate differing materials with dividers or stockpile apart to prevent mixing.

D. Prevent intermixing of soil types or contamination.

E. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

1. Grade surface of stockpiles to prevent ponding of water.
2. Cover stockpiles to minimize the infiltration of water.

F. Stockpile unsuitable and/or hazardous materials on impervious material and cover to prevent erosion and leaching, until disposed of.

3.3 STOCKPILE CLEANUP

A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

B. When borrow area is indicated, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

END OF SECTION

SECTION 31 05 16

AGGREGATES FOR EARTHWORK

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes range of coarse and fine aggregate materials intended to be referenced by other Sections, generally for fill and grading purposes. Materials are indicated by "Type" to assist in referencing from other Sections and in Drawing notes.

B. Section Includes:

1. Coarse aggregate materials.
2. Fine aggregate materials.

1.2 RELATED SECTIONS

A. Section 31 05 13 - Soils for Earthwork.
B. Section 31 22 13 - Rough Grading.
C. Section 31 23 17 - Trenching.
D. Section 31 23 19 - Dewatering.
E. Section 32 11 23 - Aggregate Base Courses.
F. Section 33 11 10 - Water Utility Distribution and Transmission Piping.

1.3 REFERENCES

A. American Association of State Highway and Transportation Officials:

1. AASHTO M147 - Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base and Surface Courses.

2. AASHTO T27 - Sieve Analysis of Fine and Coarse Aggregates.

3. AASHTO T99 - Standard Specification for Moisture-Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in.) Drop.

4. AASHTO TP61 - Standard Method of Test for Determining the Percentage of Fracture in Coarse Aggregate

B. ASTM International:

1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).

3. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).

4. ASTM D4318 - Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

5. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Materials Source: Submit name of imported materials suppliers.

C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

D. Results of aggregate sieve analysis and standard proctor tests for all granular material.

1.5 QUALITY ASSURANCE

A. Furnish each aggregate material from single source throughout the Work.

B. Aggregate Testing:

1. Aggregate sampling and testing to be completed by an independent laboratory approved by the Engineer.

2. The frequency of testing shall be determined by the Engineer.

3. All aggregate testing shall be paid for by the Contractor.

C. Compaction Tests:

1. Maximum density at optimum moisture content determined by ASTM D698 (AASHTO T99).

2. In-place density in accordance with Nuclear Testing Method, ASTM D6938.

D. Aggregate Classification: All imported materials shall be classified in accordance with ASTM D2487.

PART 2 PRODUCTS

2.1 COARSE AGGREGATE MATERIALS

A. Coarse Aggregate Type A1, Dense-Graded Aggregate: Crushed rock with 3/4 inch-0, 1 inch-0, 1-1/2 inch-0, 2 inch-0 and 2-1/2 inch-0 gradation as shown in the Drawings and meeting the requirements provided below.

1. Grading - Dense-graded base aggregate shall be crushed rock, including sand. Uniformly grade the aggregates from coarse to fine.

2. Sieve analysis shall be determined according to AASHTO T27.

3. The aggregates shall conform to one of the grading requirements Table 310516-A below.

Table 310516-A
Grading Requirements for Dense-Graded Aggregate
Separated Sizes
Percent Passing (by weight)

Sieve Size	2-1/2" - 0	2" - 0	1-1/2" - 0	1" - 0	3/4" - 0
3”	100				
2-1/2”	95 - 100	100			
2”	-	95 - 100	100		
1-1/2"	-	-	95 - 100	100	
1-1/4”	55 - 75	-	-	-	
1”	-	55 - 75	-	90 - 100	100
3/4"	-	-	55 - 75	-	90 - 100
1/2"	-	-	-	55 - 75	-
3/8”	-	-	-	-	55 - 75
1/4"	30 - 45	30 - 45	35 - 50	40 - 55	40 - 60
No. 4*	-	-	-	-	-
No. 10	[1]	[1]	[1]	[1]	[1]

[1] Of the fraction passing the 1/4 inch sieve, 40% to 60% shall pass the No. 10 sieve.
* Report percent passing sieve when no grading requirements are listed.

4. Fracture of Rounded Rock:

a. Determined according to AASHTO TP61.
b. Provide at least one fractured face based on the following percentage of particles retained on the 1/4-inch sieve for the designated size:

Minimum % of Fractured Particles
by Weight of Material

Designated Size	Retained on 1/4-Inch Sieve
1 1/2" – 0 and larger	50
Smaller than 1 1/2" – 0	70

5. Durability:

   a. Crushed rock aggregate shall meet the following durability requirements:

Test	Test Method	Requirements
Abrasion	AASHTO T 96	35.0% maximum
Degradation (Coarse Aggregate)	ODOT TM 208	30.0% maximum
Passing No. 20 Sieve, Sediment Height	ODOT TM 208	3.0” maximum

6. Sand Equivalent -- Crushed rock aggregate will be tested according to AASHTO T 176, and shall have a sand equivalent of not less than 50.

B. Coarse Aggregate Type A2, Granular Drain Backfill Material: Crushed or uncrushed rock or gravel as shown in the Drawings.

1. Material shall be clean and free-draining.
2. Sieve analysis shall be according to AASHTO T27.
3. Grading: Meeting the gradation requirements provided in Table 310516-B below.

Table 310516-B
Grading Requirements for Granular Drain Backfill Material
Separated Sizes
Percent Passing (by weight)

Sieve Size	Separated Sizes 1 1/2" – 3/4"	Separated Sizes 3/4" – 1/2"
2”	100	
1-1/2"	90 - 100	
1”	20 - 55	100
3/4"	0 - 15	85 - 100
1/2"	-	0 - 15
3/8”	0 - 5	-

2.2 SAND

A. Sand: Sand material shall consist of granular material, naturally produced or produced from crushed gravel, or dredge sand that is reasonably free of organic material, mica, clay, fly ash and other deleterious material, meeting the gradations of Table 310516-C below.

Table 310516-C
Grading Requirements for Sand
Separated Sizes
Percent Passing (by weight)

Sieve Size	Coarse Sand	Medium Sand	Fine Sand
1”	100	100	100
3/8”	95 - 100	95 - 100	-
#4	80 - 100	70 - 95	90 - 100
#30	10 - 30	10 - 45	-
#100	-	2 - 10	2 - 10
#200	0 - 8	0 - 7	0 - 4
Sand Equivalent	50 min.	50 min.	50 in.

2.3 SOURCE QUALITY CONTROL

A. Coarse Aggregate Material - Testing and Analysis: Perform in accordance with ASTM C136 and ASTM D698 (AASHTO T99).

B. Sand - Testing and Analysis: Perform in accordance with ASTM C136 and ASTM D698 (AASHTO T99).

C. When tests indicate materials do not meet specified requirements, change material and retest. Additional testing shall be completed and paid for by the Contractor with no reimbursement by the Owner.

PART 3 EXECUTION

3.1 STOCKPILING

A. Stockpile materials imported to site at shown in the Drawings or at locations as approved by Engineer for redistribution as specified.

B. Separate different aggregate materials with dividers or stockpile individually to prevent mixing.

C. Prevent intermixing of aggregate types or contamination.

D. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

1. Grade surface of stockpiles to prevent ponding of water.
2. Cover stockpiles to minimize the infiltration of water.

3.2 STOCKPILE CLEANUP

A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

B. When borrow area is indicated, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

END OF SECTION

SECTION 31 10 00

SITE CLEARING

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes clearing site of incidental paving and curbs, debris, grass, trees, and other plant life in preparation for site or building excavation work.

1.2 RELATED SECTIONS:

A. Section 01 56 39 - Tree and Plant Protection.

B. Section 02 41 00 - Demolition.

C. Section 31 22 13 - Rough Grading.

D. Section 31 23 18 - Rock Removal.

1.3 DEFINITIONS

A. Clearing: Removal of interfering or objectionable material lying on or protruding above ground surface.

B. Grubbing: Removal of vegetation and other organic matter including stumps, buried logs, and roots greater than 2-inch caliper to a depth of 12 inches below subgrade.

C. Interfering or Objectionable Material: Trash, rubbish, and junk; vegetation and other organic matter, whether alive, dead, or decaying; topsoil.

D. Limits of Disturbance: Work area boundary as shown on the Plans.

E. Root Wad: Tree stump and root mass including all roots greater than 1-inch diameter.

F. Stripping: Removal of topsoil remaining after applicable scalping is completed.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Clearing, Grubbing and Stripping Plan: Drawings clearly showing proposed limits to clearing, grubbing and stripping activities at Site.

C. Certification or disposal permit for landfill and/or waste disposal site.

D. A copy of written permission of private property owners, with copy of fill permit for said private property, as may be required for disposal of materials.

1.5 QUALITY ASSURANCE

A. Existing Conditions: Determine the extent of Work required and limitations before proceeding with Work.

B. Obtain Engineer's approval of staked clearing, grubbing, and stripping limits prior to commencing clearing, grubbing, and stripping.

C. Conform to applicable local, state and federal codes for environmental requirements and disposal of debris,

1. Burning on project site will not be permitted.
2. Use of herbicides will not be permitted.

D. Permits: The Contractor is responsible for obtaining all necessary permits required for completion of the Work described in this Section.

E. Protection of Persons and Property: Meet all federal, state and local safety requirements for the protection of laborers, other persons, and property in the vicinity of the work and requirements of the General Provisions.

PART 2 PRODUCTS

2.1 MATERIALS

A. Existing Materials: All materials, equipment, miscellaneous items and debris involved, occurring or resulting from demolition, clearing and grubbing work shall become the property of the Contractor at the place of origin, except as otherwise indicated in the Drawings or specifications.

B. Wound Paint: Emulsified asphalt formulated for use on damaged plant tissues.

PART 3 EXECUTION

3.1 GENERAL

A. Clear, grub, and strip areas needed for waste disposal, borrow, or Site improvements within limits shown in approved Clearing, Grubbing and Stripping Plan.

B. Remain within project property lines and easements at all times.

C. Do not injure or deface vegetation or structures that are not designated for removal.

3.2 EXAMINATION

A. Verify existing plant life designated to remain is tagged or identified.

B. Identify waste and salvage areas for placing removed materials.

3.3 PREPARATION

A. Carefully coordinate the work of this Section with all other work and construction.

B. Call Local Utility Line Information service at 1-800-332-2344 not less than three working days before performing Work.

C. Request underground utilities to be located and marked within and surrounding construction areas.

1. Disconnect or arrange for disconnection of utilities (if any) affected by required work.

2. Keep all active utilities intact and in continuous operations.

D. Prepare Site only after:

1. Erosion and sediment controls are in place.

a. Limit areas exposed or uncontrolled to erosion during installation of temporary erosion and sediment controls and in compliance with the Drawings and erosion and sediment control permitting.

2. Tree and vegetation protection is installed.

a. Protect existing site improvements, trees and shrubs to remain to preclude damage during construction.

b. Follow the provisions set forth in Section 01 56 39, Tree and Plant Protection for all temporary tree and plant protection measures.

3. Temporary fencing and dust prevention measures are installed along the Limits of Disturbance.

4. Notification of utility agencies; disconnect or arrange for disconnection of utilities (if any) affected by required work. Keep all active utilities intact and in continuous operation.

3.4 PROTECTION

A. Utilities: Locate, identify, and protect utilities located by utilities and indicated in the Drawings to remain from damage.

B. Survey control: Protect bench marks, survey control points, and existing structures from damage or displacement.

C. Preservation and Trimming of Trees, Shrubs and Other Vegetation:

1. Avoid injury to trees, shrubs, vines, plants, grasses and other vegetation growing outside of the areas to be cleared and grubbed and those trees and shrubs designated to be preserved.

2. Protect existing trees and shrubs against cutting, breaking or skinning of roots, skinning and bruising of bark, smothering of roots by stockpiling construction materials, excavated materials, excess foot or vehicular traffic and parking of vehicles within drip line.

3. Provide temporary guards, as necessary, to protect trees and vegetation to be left standing.

4. Temporarily cover exposed roots with wet burlap to prevent roots from drying out; cover with earth as soon as possible.

5. Provide protection for roots and limbs over 1 1/2-inch diameter cut during construction operations. Coat cut faces with emulsified asphalt.

6. Repairable damage to trees and shrubs designated to remain shall be made by a professional tree surgeon approved by the Engineer. Cost shall be borne by the Contractor.

D. Landscaped Areas:

1. When any portion of the Work crosses private property or landscaped areas, excavate topsoil separately and pile it on the opposite side of the trench from the subsoil.

2. Conduct Work in a manner that will restore original conditions as nearly as practicable.

3. Remove and replace any trees, shrubs, plants, sod or other vegetative material as needed to complete Work.

4. All shrubs or plants shall be balled by experienced workers, carefully handled and watered, and replaced in their original positions without damage. Sod shall be handled in a similar manner.

5. Wherever sod cannot be saved and restored, the ground must be reseeded and cared for until a stand of grass is reestablished.

6. Plants or shrubs killed or destroyed shall be replaced and paid for by the Contractor.

7. It is the intent of this paragraph that the Contractor shall leave the surface and plantings in substantially the same conditions as before the Work is undertaken.

E. Miscellaneous Site Features: Protect all existing miscellaneous site features from damage by excavating equipment and vehicular traffic, including but not limited to existing structures, fences, mailboxes, sidewalks, paving, and curbs.

F. Repair and Replacement:

1. Damaged items, including but not restricted to those noted above, shall be repaired or replaced with new materials as required to restore damaged items or surfaces to a condition equal to and matching that existing prior to damage or start of work of this contract.

2. Any damage to existing facilities or utilities to remain as caused by the Contractor's operations shall be repaired at the Contractor's expense.

3.5 LIMITS

A. As follows, but not to extend beyond limits of ROW, easements or erosion control, whichever is nearest to the pipe alignment:

1. Excavation: 5 feet beyond top of cut slopes.

2. Trench Excavation: 6 feet from trench centerline, regardless of actual trench width.

3. Fill:

a. Clearing and Grubbing: 5 feet beyond toe of permanent fill.
b. Stripping: 2 feet beyond toe of permanent fill.

4. Structures: 15 feet outside of new structures.

5. Roadways: Clearing, grubbing, scalping, and stripping 5 feet from roadway shoulders.

6. Other Areas: As shown.

B. Remove rubbish, trash, and junk from entire area within the Limits of Disturbance as material is generated. Stockpiling shall not be permitted without written approval of Owner.

3.6 CLEARING AND GRUBBING

A. Clear and grub areas within limits shown in approved Clearing, Grubbing and Stripping Plan.

B. Except in areas to be excavated, all holes resulting from the clearing and grubbing operations shall be backfilled and compacted in accordance with the applicable sections of these Specifications.

C. Clearing:

1. Remove trees, saplings, snags, stumps, shrubs, brush, vines, grasses, weeds and other vegetative growth within the clearing limits shown in the Drawings, except those trees and shrubs noted to remain in the Drawings or as directed by the Engineer.

2. Clearing shall be performed in such a manner as to remove all evidence of the presence of vegetative growth from the surface of the project site and shall be inclusive of sticks and branches of thickness or diameter greater than 3/8-inch and of grasses, weeds, exceeding 12 inches in height except as otherwise indicated.

3. Clear undergrowth and deadwood, without disturbing subsoil.

D. Grubbing: Clear areas required for access to site and execution of Work and remove all stumps, root wads, and roots over 1-inch diameter to the following depths:

1. Future Structures and Building Areas 24 Inches
2. Roads and Parking Areas 18 Inches
3. All other Areas 12 Inches

3.7 TREE REMOVAL

A. Exercise care in cutting, felling, trimming, and handling of those trees shown for removal to prevent damage to neighboring trees and structures to remain.

B. Tree Salvage: As shown on the Plans.

C. No trees may be removed unless approved and permitted by the Engineer.

D. Do not top trees unless otherwise specified or approved by Owner in writing.

E. Refer to Section 01 56 39, Temporary Tree and Plant Protection for tree protection requirements.

3.8 REMOVAL AND DISPOSAL

A. Native vegetation may be mulched and used on Site.

B. Asphalt and Gravel Surfaces:

1. Asphalt, concrete, and gravel surfaces designated for removal shall be done to full depth.

2. Asphalt, concrete, and gravel removed at Site may be reused at Site where shown in the Drawings or following approval of the Engineer.

3. Haul removed asphalt, concrete, and gravel which is unsuitable for reuse or that exceeds quantity required.

C. Remove debris, rock, abandoned piping and extracted plant life from Site.

D. Remove from the Site all debris, materials, equipment and items found thereon and materials and debris resulting from the Work, except as otherwise indicated.

1. All existing improvements designated on the Drawings or specified to be removed including but not limited to structures, pipelines, walls, footings, foundations, slabs, pavements, curbs, fencing and similar structures occurring above, at, or below existing ground surface shall be included in the Work.

2. Unless otherwise specified, any resulting voids shall be thoroughly cracked out for drainage and backfilled with suitable excavated or imported material compacted to the density of the adjacent soil.

E. Continuously clean-up and remove waste materials from site. Do not allow materials to accumulate on site.

F. Do not burn or bury materials on site. Leave site in clean condition.

G. Removal: All material resulting from demolition, clearing and grubbing, and trimming operations shall be removed from the Site and disposed of in a lawful manner. Materials placed on property of private property owners shall be by written permission only.

H. Cleanup: During and upon completion of work, promptly remove all unused tools and equipment, surplus materials and debris.

I. Adjacent areas shall be returned to their existing condition prior to the start of Work.

3.9 CLEANUP

A. During the time Work is in progress, make every effort to maintain the Site in a neat and orderly condition.

B. All refuse, broken pipe, excess fill material, cribbing and debris shall be removed as soon as practicable.

C. Should the Work not be maintained in a satisfactory condition, the Owner may cause the work to stop until the cleanup of the Work has been done to the satisfaction of the Engineer.

D. The Work will not be considered complete or the final payment certificate issued until all rubbish, unused material, or equipment shall have been removed and the premises left in a condition satisfactory to the Owner and the Engineer.

END OF SECTION

SECTION 31 22 13

ROUGH GRADING

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes rough grading and filling associated with contouring of Site in preparation for building excavation and subsequent site work.

B. Section Includes:

1. Excavating topsoil.
2. Excavating subsoil.
3. Cutting, grading, filling, and rough contouring of Site.

1.2 RELATED SECTIONS:

A. Section 01 45 00 - Quality Control
B. Section 31 05 13 - Soils for Earthwork.
C. Section 31 05 16 - Aggregates for Earthwork.
D. Section 31 10 00 - Site Clearing.
E. Section 31 23 16 - Excavation.
F. Section 31 23 17 - Trenching.
G. Section 31 23 18 - Rock Removal.

1.3 REFERENCES

A. American Association of State Highway and Transportation Officials:

1. AASHTO T99 - Standard Specification for Moisture-Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in.) Drop.

B. ASTM International:

1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).

3. ASTM D2419 - Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.

4. ASTM D2434 - Standard Test Method for Permeability of Granular Soils (Constant Head).

5. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

6. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Soils for Earthwork: As specified in Section 31 05 13, Soils for Earthwork.

C. Aggregates for Earthwork: As specified in Section 31 05 16, Aggregates for Earthwork.

1.5 CLOSEOUT SUBMITTALS

A. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with ASTM C136, ASTM D2419, and ASTM D2434.

PART 2 PRODUCTS

2.1 MATERIALS

A. Subsoil Fill: Type S1 as specified in Section 31 05 13, Soils for Earthwork.

B. Topsoil: As specified in Section 31 05 13, Soils for Earthwork.

1. Type TS1, Select Native Topsoil Material, as may be available.
2. TS2, Imported Topsoil Material, as may be required.

C. Structural Fill: Type A1, Dense-Graded Aggregate as specified in Section 31 05 16, Aggregates for Earthwork. Size of aggregate as shown in the Drawings.

D. Granular Fill: Type A2, Granular Drain Backfill Material as specified in Section 31 05 16, Aggregates for Earthwork. Size of aggregate as shown in the Drawings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify survey benchmark and intended elevations for the Work are as indicated on Drawings.

3.2 PREPARATION

A. Call Local Utility Line Information service at 1-800-332-2344 not less than three working days before performing Work.

1. Request underground utilities to be located and marked within and surrounding construction areas.

2. Notify Engineer of any potential conflicts resulting from utility locations and the Drawings.

3. Notify utility company to remove and relocate utilities, as may be necessary.

B. Identify required lines, levels, contours, and datum.

C. See Section 31 10 00, Site Clearing for additional requirements in protection of existing utilities, survey control, plant life and landscaped areas in coordination with the Work of this Section.

3.3 TOPSOIL EXCAVATION

A. Excavate and stockpile topsoil as specified in Section 31 15 13, Soils for Earthwork.

3.4 SUBSOIL EXCAVATION

A. Excavate subsoil from areas to be further excavated, re-landscaped, or re-graded as shown in the Drawings.

B. When practical, do not excavate wet subsoil. When wet subsoil must be excavated, and is to be reused on site for the Work, process wet material to obtain optimum moisture content.

C. Stockpile excavated material in designated areas in accordance with Section 31 05 13, Soils for Earthwork.

D. When excavating through roots, perform Work by hand and cut roots with sharp axe.

E. Benching Slopes: Horizontally bench existing slopes greater than 1: 2 to key placed fill material to slope to provide firm bearing.

F. Stability: Replace damaged or displaced subsoil as specified for fill.

3.5 FILLING

A. General:

1. Grading and filling operations shall not take place when weather conditions and moisture content of fill materials prevent the attainment of specified density.

2. Vertical curves or roundings at abrupt changes in slope shall be established as approved by Engineer.

3. Bring all graded areas to a relatively smooth, even grade and slope by blading or dragging. Remove high spots and fill depressions.

B. Fill areas to contours and elevations shown in the Drawings with unfrozen materials.

C. Topsoil Fill:

1. Scarify prepared subgrade to depth of 4 inches immediately prior to placing topsoil.

2. Place topsoil in areas to be seeded to depths indicated in the Drawings, minimum depth of 6 inches.

3. Place topsoil material loose; do not compact, do not place in wet or muddy conditions.

D. Place material in continuous layers as follows:

1. Subsoil Fill: Maximum 8 inches compacted depth.
2. Structural Fill: Maximum 12 inches compacted depth.
3. Granular Fill: Maximum 12 inches compacted depth.

E. Maintain optimum moisture content of fill materials to attain required compaction density.

F. Slope grade away from building minimum 2 percent slope for minimum distance of 10 feet, unless noted otherwise.

G. Make grade changes gradual. Blend slope into level areas.

H. Repair or replace items indicated in the Drawings to remain which are damaged by excavation or filling. All costs shall be borne by the Contractor.

3.6 TOLERANCES

A. Top Surface of Subgrade: Plus or minus 1/10 of a foot from required elevation.

3.7 FIELD QUALITY CONTROL

A. Perform laboratory material tests in accordance with ASTM D698 (AASHTO T99).

B. Perform in place compaction tests in accordance with the following:

1. Density Tests: ASTM D2922.
2. Moisture Tests: ASTM D3017.

C. Frequency and location of testing is dependent upon type of material placed. See Section 01 45 00, Quality Control for testing requirements.

D. When tests indicate Work does not meet specified requirements, remove Work, replace and retest at the sole expense of the Contractor.

END OF SECTION

SECTION 31 23 16

EXCAVATION

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes excavation required for building foundations, site structures, or under slabs-on-grade or paving. Excavating for utilities outside building is included in Section 31 23 17, Trenching.

B. Section Includes:

1. Excavating for building foundations.
2. Excavating for paving, roads, and parking areas.
3. Excavating for slabs-on-grade.
4. Excavating for site structures.
5. Excavating for landscaping.

1.2 RELATED SECTIONS

1. Section 01 45 00 - Quality Control.
2. Section 02 41 00 - Demolition.
3. Section 26 42 01 – Corrosion Monitoring System for Ductile Iron Pipe
4. Section 31 05 13 - Soils for Earthwork.
5. Section 31 05 16 - Aggregates for Earthwork.
6. Section 31 10 00 - Site Clearing.
7. Section 31 22 13 - Rough Grading.
8. Section 31 23 17 - Trenching.
9. Section 31 23 18 - Rock Removal.
10. Section 31 23 19 - Dewatering.
11. Section 33 11 10 - Water Utility Distribution and Transmission Piping.
12. Supplemental Information: Appendix B - Geotechnical report; bore hole locations and findings of subsurface materials.

1.3 DEFINITIONS

A. Common Excavation: All excavation required for Work, regardless of the type, character, composition or condition of the material encountered. Common Excavation shall further include all debris, junk, broken concrete, and all other material. All excavation shall be classified as Common Excavation, unless provided as Rock for under Section 31 23 18, Rock Removal below.

B. Common Material: All soils, aggregate, debris, junk, broken concrete, and miscellaneous material encountered in Common Excavation, excluding rock as defined below.

C. Concrete Excavation: The removal of pieces of concrete larger than 1 cubic yard in volume that requires drilling, splitting and breaking methods, or a necessitating a trench width increase of 18 inches or more than the width of the preceding 10 feet of trench. Concrete excavation includes materials composed of Portland cement that are not identified other than manholes, structures, sewer pipe, or other appurtenances.

D. Exploratory Excavation: The removal and replacement of material from locations shown on the Drawings, or as directed for the purpose of investigating underground conditions and identifying potential utility conflict between existing and proposed utilities.

E. Overbreak: Material beyond and outside of the slope limits established by the Owner's Representative, which becomes displaced or loosened during excavation and is excavated.

F. Pothole Excavation: Pothole excavation is the removal and replacement of all materials via coring, vacuum extraction, or similar method, not classified as exploratory excavation, for the purposes of locating an underground utility and to investigate underground conditions.

G. Rock Removal: As defined in Section 31 23 18, Rock Removal.

H. Spoils: Excavated materials from Site unsuitable for use as fill or not required for backfill and grading.

I. Unsuitable Materials: See Spoils.

1.4 REFERENCES

A. Local utility standards when working within 24 inches of utility lines.

1.5 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Excavation Protection Plan: At a minimum, to include the following:

1. Methods and sequencing of mass excavation.

2. Proposed onsite and off-site spoil disposal locations.

3. Anticipated difficulties and proposed resolutions.

4. Proposed routes for Owner's access to Owner's facilities impacted by excavation Work.

5. Proposed haul routes.

1.6 QUALITY ASSURANCE

A. Allowable Tolerances: Final grades shall be plus or minus 0.1-foot.

B. Provide adequate survey control to avoid unauthorized overexcavation.

C. Weather Limitations:

1. Material excavated when frozen or when air temperature is less than 32 degrees F shall not be used as fill or backfill until material completely thaws.

2. Material excavated during inclement weather shall not be used as fill or backfill until after material drains and dries sufficiently for proper compaction.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION

3.1 PREPARATION

A. Prior to commencing work in this Section, become familiar with site conditions. In the event discrepancies are found, notify the Engineer as to the nature and extent of the differing conditions.

B. Call Local Utility Line Information service at 1-800-332-2344 not less than three working days before performing Work.

1. Request underground utilities to be located and marked within and surrounding construction areas.

2. Coordinate with and notify utility companies should it be necessary to remove or relocate facilities.

C. Identify required lines, levels, contours, and datum.

D. See Section 31 10 00, Site Clearing for additional requirements in protection of existing utilities, survey control, plant life and landscaped areas in coordination with Work in this Section.

3.2 SITE CONDITIONS

A. Quantity Survey: The Contractor shall be responsible for calculations for quantities and volume of cut and fill from existing site grades to finish grades established under this contract as indicated in the Drawings or specified and shall include the cost for all earthwork in the total basic bid.

B. Dust Control: Must meet all federal, state and local requirements. Protect persons and property from damage and discomfort caused by dust. Water surfaces as necessary and when directed by Engineer to quell dust.

C. Soil Control: Soil shall not be permitted to accumulate on surrounding streets or sidewalks nor to be washed into sewers.

3.3 EXISTING UNDERGROUND UTILITIES

A. Protect active utilities encountered, located or otherwise, and notify persons or agencies owning same.

B. Remove inactive or abandoned utilities from within the project grading limits in accordance with Section 33 11 50, Existing Pipe Abandonment.

C. For sewer and other miscellaneous drainage facilities, fill and plug pipes as follows:

1. General:

    a. Remove all structures to a minimum of 3 feet below subgrade, unless otherwise noted.

    b. Cover top surface of all abandoned structures with two sheets of nonwoven geotextile, extended at least 1 foot beyond the outside walls of the abandoned manhole, sump, or basin.

    c. Plug all abandoned pipes with permanent plugs as specified in Section 33 11 50, Existing Pipe Abandonment.

2. Sumps:

    a. Remove existing sediment, soil, and water. Properly dispose of these materials in accordance with the requirements of these specifications.

    b. Remove top cone and first solid concrete section to a depth of approximately 8 to 10 feet below ground.

    c. Fill sump with CLSM.

d. Backfill remaining voids for facilities within existing or proposed roadways with approved materials meeting the requirements of Section 32 11 23, Aggregate Base Courses.

3. Salvaging Manhole Frames, Covers, and Grates:

a. Remove manhole frames, covers, and grates scheduled for salvage and store in approved location.

b. Frames, grates, and covers meeting Specifications may be salvaged from structures to be adjusted and may be reused in the Work if of suitable size and condition.

c. Replace, at no additional cost to the Owner, all items damaged or lost by the Contractor with similar items that are comparable in all respects with those they are to replace, and which are adequate for the intended purpose.

d. Clean salvaged components to be reused of foreign material by methods that will not harm the components.

4. Existing Manhole Frames and Covers: Manhole frames and covers removed by the Contractor are the property of the Owner. Notify the Engineer a minimum of 48 hours before removal to arrange for pickup of the removed frames and covers, if not reused.

3.4 PRESERVATION OF EXISTING IMPROVEMENTS

A. Protect adjacent existing structures which may be damaged by excavation work.

1. Conduct operations in such a manner that existing street facilities, utilities, railroad tracks, structures, and other improvements, which are to remain in place, will not be damaged. Furnish and install cribbing and shoring or whatever means necessary to support material around existing facilities, or to support the facilities themselves, and maintain such supports until no longer needed.

2. Open slopes shall not be cut within 5 feet of any existing spread footings unless approved by the Engineer.

3. Do not interfere with 45 degree bearing splay of foundations unless approved by the Engineer

4. Excavated material shall not be placed adjacent to existing or proposed structures.

3.5 EXCAVATION

A. General:

1. Method of excavation shall be the Contractor's option, but care shall be exercised as final grade is approached to leave it in undisturbed condition.

2. If the final grade for supporting structures is disturbed, it shall be restored to requirements of these Specifications and satisfaction of the Engineer at no additional cost to Owner.

3. The Contractor is advised that footings should be poured as soon as possible to minimize unfavorable final grade conditions from developing.

4. Provide all measures to ensure public safety.

B. Control of Water:

1. Provide and maintain equipment to remove and dispose of water during the course of the work of this Section and keep excavations dry and free of frost or ice.

2. Bearing surfaces that become softened by water or frost must be re-excavated to solid bearing at Contractor's expense and backfilled with compacted crushed rock at Contractor's expense.

3. Grade top perimeter of excavation to prevent surface water from draining into excavation.

4. See additional requirements in Section 31 23 19, Dewatering.

C. Frozen Ground: Frost protection shall be provided for all structural excavation work. Foundation work shall not be placed on frozen ground.

D. Excavate material of every nature and description to the lines and grades as indicated in the Drawings and/or as required for construction of the facility.

1. Allow for forms, shoring, working space, granular base, topsoil and similar items, wherever applicable.

2. Trim excavations to neat lines. Remove loose matter and lumped subsoil.

E. Excavated Materials: Soils excavated at Site will be treated and used as one of two general categories of material as provided below.

1. Fill:

a. Subsoil Type S1, Select Native Fill, as approved for use by Engineer.

2. Spoils:

a. Ensure there is sufficient suitable material available to complete embankments and other required fillings prior to disposing of any excavated materials.

b. Make arrangements for disposal of spoils and include as part of contract work in preparing of project bids.

c. Landfill permit or written permission from private property owner to be obtained by the CONTRACTOR and provided to the ENGINEER.

F. Shoring:

1. The Contractor shall be solely responsible for excavation protection and worker safety and shall provide sheeting and shoring wherever required, all in accordance with current local, state and federal laws, codes and ordinances.

2. Where shoring, sheet piling, sheeting, bracing, lagging, or other supports are necessary to prevent cave-ins or damage to existing structures, it shall be the responsibility of the Contractor to design, furnish, place, maintain and remove such supports in accordance with applicable ordinances and safety requirements.

3. The design, planning, installation and removal of all sheeting, accomplished in such a manner as to maintain the undisturbed state of the soil below and adjacent to the excavation.

G. Slope existing banks with machine to angle of repose or less until shored.

1. Shape, trim, and finish cut slopes to conform to lines, grades, and cross-sections shown, with proper allowance for topsoil or slope protection, where shown.

2. Protection of excavation side slopes:

a. Use excavation methods that will not shatter or loosen excavation slopes.

b. Where practical, excavate materials without previous loosening and in limited layers or thickness to avoid breaking the material back of the established slope line.

c. Avoid overbreaks. Overbreak is incidental to the Work, except in cases where the Owner's Representative determines that such overbreak was unavoidable.

d. Excavation in rock or rocky cuts:

1) Once completed, thoroughly test the slopes with bars or other approved means to remove all loose, detached, broken, or otherwise unstable material.

2) Remove jutting points. Scale slopes using mine scaling rods or other approved methods to remove loose or overhanging materials and provide a safe, trim, neat, and stable condition.

3) Dispose of the materials removed under this subparagraph in the same manner as other excavated material.

e. Remove all exposed roots, debris, and all stones more than 3 inches in size which are loose or could become loosened.

3. Construct slopes free of all exposed roots.

4. Construct slopes free of unstable rock and loose stones exceeding 3 inches in diameter.

5. Round tops of cut slopes in soil to not less than a 6 foot radius, provided such rounding does not extend off-site, outside of easements, outside of rights-of-way, or adversely impacts existing facilities, adjacent property, or completed Work.

6. Trim all surfaces neatly and smoothly.

H. Compact disturbed load bearing soil in direct contact with foundations to original bearing capacity; perform compaction in accordance with Section 31 23 17, Trenching and Section 31 23 23, Fill.

I. Notify Engineer of unexpected subsurface conditions.

J. Overexcavation for Unsuitable Foundation Conditions:

1. Cross-sectional dimensions and depths of excavations shown in the Drawings shall be subject to such changes as may be found necessary by the Engineer to secure foundations free from soft, weathered, shattered and loose material or other objectionable materials.

2. Unsuitable materials encountered shall be removed and replaced with Coarse Aggregate Type A1, 2-1/2 inch – 0 gradation, as specified in Table 310516-A of Section 31 05 16, Aggregates for Earthwork. All material placed shall be compacted to 95 percent of maximum dry density.

3. Unsuitable materials shall be removed and replaced only as directed in writing by Engineer.

K. Rock Removal:

1. Remove boulders and rock up to 1/2 cubic yard measured by volume per the requirements of this Section.

2. Remove larger boulders and rock material as specified in Section 31 23 18, Rock Removal.

3. Concrete removal, as defined herein, shall be treated as Rock Removal.

L. Stockpile excavated material in area(s) designated on or off site in accordance with Section 31 05 13, Soils for Earthwork.

3.6 FIELD QUALITY CONTROL

A. Perform excavation and controlled fill operations in accordance with the requirements of this Section.

B. Coordinate the visual inspection and approval of all bearing surfaces by Engineer before installing subsequent work.

3.7 PROTECTION

A. Prevent displacement or loose soil from falling into excavation; maintain soil stability and store excavated materials at a distance from top of excavation.

B. Protect structures, utilities and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth operations.

END OF SECTION

SECTION 31 23 17

TRENCHING

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes the requirements for excavation and backfill of all utilities, including installation of pipe bedding, pipe zone backfill, and trench backfill and related Work as shown on the Drawings and as specified.

B. Section includes:

1. Excavating trenches for pipe, utility vaults and other utilities.
2. Compacted fill from top of utility bedding to final grades.
3. Trench and utility vault backfilling and compaction.

C. Related Sections

1. Section 01 45 00 - Quality Control.
2. Section 03 30 00 - Cast-In-Place Concrete.
3. Section 31 05 13 - Soils for Earthwork.
4. Section 31 05 16 - Aggregates for Earthwork.
5. Section 31 10 00 - Site Clearing.
6. Section 31 22 13 - Rough Grading.
7. Section 31 23 16 - Excavation.
8. Section 31 23 18 - Rock Removal.
9. Section 33 11 10 - Water Utility Distribution & Transmission Piping.
10. Supplemental Information: Geotechnical report; bore hole locations and findings of subsurface materials.

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:

1. AASHTO T99 - Standard Specification for Moisture-Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in.) Drop.

B. ASTM International:

1. ASTM C403 - Standard Test Method for Time of Setting of Concrete Mixtures by Penetration Resistance.

2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).

3. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

4. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

5. D4832, Standard Test Method for Preparation and Testing of Controlled Low Strength Material (CLSM) Test Cylinders.

1.3 DEFINITIONS

A. Controlled Low Strength Material (CLSM): Also referred to as Flowable Fill. Lean cement concrete fill. A self-compacting, cementitious material.

B. Flexible Pipe: For the purposes of these Specifications, tubing between ½-inch and 4-inch diameter constructed of polyvinyl chloride (PVC) and high density polyethylene (HDPE) are considered flexible pipes. HDPE piping 4 inches in diameter and larger is also considered flexible pipe.

C. Geosynthetics: Geotextiles, geogrids, geomembranes, and drainage composite materials.

D. Imported Material: Materials obtained from sources offsite, suitable for specified use.

E. Lift: Loose (uncompacted) layer of material.

F. Obstructions: Items which may be encountered during utility and vault trenching which do not require replacement.

G. Optimum Moisture Content:

1. Determined in accordance with ASTM Standard specified to determine maximum dry density for relative compaction.

2. Determine field moisture content on basis of fraction passing 3/4-inch sieve.

H. Pipe Bedding: Trench backfill zone for full trench width which extends from the bottom outside surface of the pipe to a minimum of 6 inches below the bottom outside surface of pipe, conduit, cable or duct bank to the trench foundation so as to uniformly support the barrel of the pipe.

I. Pipe Zone: Trench backfill zone for full trench width which extends from the bottom outside surface of the pipe to a minimum of 12 inches above the top outside surface of pipe, conduit, cable or duct bank.

J. Pipe Bedding, Pipe Zone and Trench Backfill Classifications:

1. Class A: Backfill with suitable native or imported material that is approved to meet the characteristics required for the specific surface loading or other criteria of the backfill zone.

2. Class B: Backfill with imported granular material consisting of gravel or crushed rock meeting the requirements of this Section and Coarse Aggregate Type A1 as specified in Section 31 05 16, Aggregates for Earthwork; typical designated size shall be 1”-0 or ¾”-0.

3. Class C: Backfill with Fine Sand, as specified in Section 31 05 16, Aggregates for Earthwork.

4. Class D: Backfill with approved pit run or bar run material, well-graded from coarse to fine; maximum dimension shall be 3 inches.

5. Class E: Backfill with CLSM. See Section 31 23 24, Flowable Fill.

K. Pothole Excavations: Removal and replacement of all materials via coring, vacuum extraction, or similar method for the purposes of locating an underground utility and to investigate underground conditions.

L. Prepared Trench Bottom: The bottom of the trench on which the pipe bedding is to lie and which provides support for the pipe.

M. Relative Compaction: Ratio, in percent, of as-compacted field dry density to laboratory maximum dry density as determined in accordance with ASTM Standards.

N. Rigid Pipe: For the purposes of these Specifications, pipe constructed of PVC, ductile iron, steel, concrete and clay pipes are considered rigid pipes.

O. Sewer, Pipes, and Mains: Conduits of circular or other geometric shapes, used to convey liquids or gases, or other material.

P. Trench Backfill: Trench backfill zone for full trench width extending from the top of the pipe zone to pavement base rock, ground surface or other surface material.

Q. Trench Stabilization: Removal of unsuitable material in the bottom of a trench and replacement with specified material for support of a pipe, main, conduit, structure, or appurtenances.

R. Utility: Any buried pipe, duct, conduit, or cable.

S. Well-Graded: A mixture of particle sizes with no specific concentration or lack thereof of one or more sizes that, when compacted, produces a strong and relatively incompressible soil mass free from detrimental voids.

1.4 SUBMITTALS

A. Section 01 33 00, Submittal Procedures: Requirements for submittals.

B. Excavation Protection Plan: At a minimum, to include the following:

1. Methods and sequencing of mass excavation.

2. Proposed on-site and off-site spoil disposal locations.

3. Anticipated difficulties and proposed resolutions.

4. Proposed routes for Owner’s access to Owner’s facilities impacted by excavation Work.

5. Proposed haul routes.

C. Product Data:

1. Geotextile fabric, indicating fabric and construction.
2. Marking tapes;
3. Tracer wire;
4. Connectors for tracer wire and/or marking tapes;
5. Tracer wire locate boxes;
6. Marker balls;
7. Locator stations;
8. Ground wires;
9. Plastic or copper markers for service laterals.

D. Imported Materials:

1. Materials Source: Submit name and location of imported fill materials suppliers.

2. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

3. Submit results of aggregate sieve analysis and standard proctor test for granular material.

E. CLSM: Mix designs in accordance with Submittal requirements of Section 31 23 24, Flowable Fill.

F. Concrete: Mix designs in accordance with Submittal requirements of Section 03 30 00, Cast-in-Place Concrete.

1.5 QUALITY ASSURANCE

A. Subsoil and topsoil fill materials: In accordance with Quality Assurance requirements stated in Section 31 05 13, Soils for Earthwork.

B. Aggregate fill materials: In accordance with Quality Assurance requirements stated in Section 31 05 16, Aggregates for Earthwork.

C. CLSM:

1. In-place testing: In accordance with ASTM C403.
2. Compressive testing: In accordance with ASTM D4832.

D. Allowable Tolerances: Final grades shall be plus or minus 0.1-foot.

1.6 COORDINATION

A. Verify Work associated with lower elevation utilities is complete before placing higher elevation utilities.

B. Coordinate trenching and utility installation work with other work at utility construction location occurring near or adjacent to specified herein.

PART 2 PRODUCTS

2.1 FILL MATERIALS

A. Subsoil Fill: Type S1, Select Native Material as specified in Section 31 05 13, Soils for Earthwork.

B. Imported Granular Fill: Coarse Aggregate Type A1, Dense-Graded Aggregate with gradation as shown in the Drawings and specified in Section 31 05 16, Aggregates for Earthwork.

C. Concrete:

1. Lean concrete as specified in Section 31 23 24, Flowable Fill, with compressive strength of 100 psi.

2. Structural concrete as specified in Section 03 30 00, Cast-in-Place Concrete with compressive strength of 3,000 psi.

D. Drain Rock: Coarse Aggregate Type A2, Granular Drain Backfill Material with gradation as shown in the Drawings and specified in Section 31 05 16, Aggregates for Earthwork.

E. Sand: As specified in Section 31 05 16, Aggregates for Earthwork.

F. Trench Stabilization Material: Coarse Aggregate Type A1, Dense-Graded Aggregate, 2-1/2" - 0 gradation as specified in Section 31 05 16, Aggregates for Earthwork.

2.2 MARKING TAPE

A. Detectable:

1. Solid aluminum foil, visible on unprinted side, encased in protective high visibility, inert polyethylene plastic jacket.

2. Foil Thickness: Minimum 0.35 mils.

3. Laminate Thickness: Minimum 5 mils.

4. Width: 6 inches.

5. Identifying Lettering: Minimum 1-inch high, permanent black lettering imprinted continuously over entire length.

6. Joining Clips: Tin or nickel-coated furnished by tape manufacturer.

7. Manufacturers and Products:

a. Reef Industries; Terra Tape, Sentry Line Detectable.
b. Mutual Industries; Detectable Tape.
c. Presco; Detectable Tape.

B. Color: In accordance with APWA Uniform Color Code for Temporary Marking of Underground Facilities and as specified in NEMA Z535.1, Safety Color Code.

Color	Facility
Red	Electric power lines, cables, conduit, and lightning cables
Orange	Communicating alarm or signal lines, cables, or conduit
Yellow	Gas, oil, steam, petroleum, or gaseous materials
Green	Sewers and drain lines
Blue	Potable water
Purple	Reclaimed water, irrigation, and slurry lines

2.3 ELECTRONIC LOCATING MATERIALS

A. Marker Balls:

1. Exterior Material: High-density polyethylene.

2. Size: Maximum 4.5 inches in diameter.

3. Range: Locatable with standard electronic marker locating devices at depths up to 5 feet.

4. Field Type: Spherical RF field regardless of orientation.

5. Contain no floating or movable parts, and no batteries or active components.

6. Color: Provide colored marker balls per Article 2.03 B above.

7. Manufacturer and Product: Omni Marker Model 162 (green), Omni Marker Model 161 (blue), or approved equal.

B. Tracer Wire:

1. Direct burial No. 12 AWG solid, annealed copper-clad steel (CCS) high strength tracer wire.

2. Tensile Breaking Load: 380-pound average.

3. Jacket:

   a. High molecular weight high-density polyethylene complying with ASTM D1248, 30-volt rating.

   b. Color: Provide in colors per Article 2.03 B above.

4. Manufacturer and Product: Copperhead Industries; LLC, 12 CCS high strength reinforced tracer wire, or approved equal.

C. Tracer Wire Connectors:

1. Waterproof, corrosion proof and suitable for No. 12 AWG solid core wire.

2. Prefilled with silicone and suitable for use with low-voltage tracer lines of less than 50 volts.

3. Lug Connectors:

   a. Waterproof plastic housing that encases the silicone prefilled lug terminals.

b. Manufacturer and Product: King Innovations; DryConnTM Direct Bury Lug, or approved equal.

4. Twist Connectors:

a. Waterproof epoxy-filled packaging that encases the silicone prefilled twist connectors.

b. Manufacturer and Product: 3M Division; DBY Direct Bury Splice Kit 09053 connectors, or approved equal.

D. Ground Wire: No. 12 AWG bare solid copper wire.

E. Locator Station:

1. Test Station:

a. Lexan® polycarbonate.
b. Color: Provide in colors per Article 2.03 B above.

2. Terminals suitable for No. 12 AWG leads.

3. Use single (two lead) locator stations with two terminals, one for ground wire and one for tracer wire, when only one tracer wire is terminated in manhole.

4. Use multilead locator stations with the appropriate number of terminals when 2 or more tracer wire leads are terminated in manhole.

5. Manufacturer and Product: Cott Manufacturing Company; FlangeFink® Cathodic Protection Test Station.

2.4 VISUAL IDENTIFICATION MATERIALS

A. Tracer Wire Locate Boxes:

1. Material: Polyolefin.

2. Cover:

a. Color: Provide in colors per Article 2.03 B above.

b. Provide box cover identification marking for facility type such as “Sewer Locate Wire”, as approved by Owner.

c. Locking type with a nominal 6-inch opening.

3. Manufacturer and Product: Carson Industries LLC; L Series Model 708, or approved equal.

B. Service Lateral Plastic or Copper Markers:

1. Service Lateral Plastic or Copper Markers: Use markers of the type that requires installation to be recessed below grade.

a. Material: Plastic or copper. In new concrete, use “new construction” markers; in existing concrete use “retrofit” markers and use adhesive recommended by the manufacturer.

b. Plastic Pavement Markers:

1) UV stabilized and fade resistant.

2) Material: Meet or exceed a tensile strength of 3,500 psi, and meet test requirements as outlined in ASTM G53, Standard Practice for Light and Water Exposure of Nonmetallic Material.

3) Color: Provide in color per Article 2.03 B above with the words, “WARNING, BURIED [UTILITY TYPE], Call Before You Dig,” molded to the top of marker.

a) Provide wording for specific facility as approved by Owner.

4) Manufacturer and Product: Rhino Marking and Protective Systems; A-TAG pavement markers, or approved equal.

c. Copper Pavement Markers:

1) Material: Copper material chosen by manufacturer.

2) Diameter: 1-5/32 inch.

3) Wording: Provide facility identification wording stamped on the top such as “Sewer Lateral” as approved by Owner.

4) Manufacturer and Product: Berntsen Concrete Marker; BP2-U, or approved equal.

C. Service Lateral 2-inch by 4-inch Markers:

1. S4S Douglas fir, pressure-treated 2-inch by 4-inch lumber, utility grade or better.

2. Grade stamped by an American Lumber Standards certified inspection agency.

PART 3 EXECUTION

3.1 PREPARATION

A. Call Local Utility Line Information service at 1-800-332-2344 not less than three working days before performing Work.

1. Request underground utilities to be located and marked within and surrounding construction areas.

2. Coordinate with and notify utility companies should it be necessary to remove or relocate facilities.

3. Maintain and protect above and below grade utilities indicated to remain.

B. Identify required lines, levels, contours, and datum locations.

C. Drawings and/or specifications cover and govern replacement and restoration of foreseeable damage.

D. The site of an open cut excavation shall be first cleared of all obstructions preparatory to excavation in accordance with Section 31 10 00, Site Clearing.

E. See Section 31 10 00, Site Clearing for additional requirements in protection of existing utilities, survey control, plant life and landscaped areas in coordination with Work in this Section.

1. Intent of Drawings and Specifications is that all streets, structures, and utilities be left in condition equal to or better than original condition.

2. Where damage occurs, and cannot be repaired or replaced, the Contractor shall purchase and install new material, which is satisfactory to Owner.

F. Potholing / Exploratory Test Pits: Dig such exploratory test pits and perform potholing as may be necessary in advance of trenching to determine the exact location and elevation of subsurface structures, pipelines, duct banks, conduits, and other obstructions which are likely to be encountered or need to be connected to and shall make acceptable provision for their protection, support, and maintenance of their continued operation.

G. Paved or Surfaced Streets:

1. Wherever paved or surfaced streets are cut, saw wheel or approved cutting devices shall be used.

2. Width of pavement cut shall be as shown in the Drawings.

3. Any cut or broken pavement shall be removed from site during excavation.

H. Traffic:

1. Maintain street traffic at all times as required by the Drawings and as specified herein.

2. Erect and maintain barricades, warning signs, traffic cones, and other safety devices during construction in accordance with the latest edition of Manual of Uniform Traffic Control Devices (MUTCD), Part 6, to protect the traveling public in any area applicable.

3. Provide flaggers as required during active work in roadway areas.

I. Operations shall be confined to rights-of-way and easements provided. Avoid encroachment on, or damage to, private property or existing utilities unless prior arrangements have been made with copy of said arrangement submitted to Engineer.

3.2 EASEMENTS

A. Where portions of the Work are located on private property, easements and permits will be obtained by the Owner. Easements shall provide for the use of property for construction purposes to the extent indicated on the easements.

B. Copies of these easements and permits will be available from the Owner for inspection by the Contractor. It shall be the Contractor's responsibility to determine the adequacy of the easement obtained in every case.

C. Confine construction operations to within the easement limits or street right-of-way limits, or make special arrangements with the property owners for the additional area required and notify the Engineer with a copy of the written approval from property owners of any such conditions.

D. Any damage to private property, either inside or outside the limits of right-of-way or easements provided by the Owner, resulting from Work shall be the responsibility of the Contractor. Before the Engineer will authorize final payment, the Contractor will be required to furnish the Owner with written releases from property owners where the Contractor has obtained special agreements or easements or where the Contractor's operations, for any reason, have not been kept within the construction right-of-way obtained by the Owner.

3.3 PROTECTION

A. Existing Facilities:

1. It is the intent of these specifications that all streets, structure, and utilities be left in a condition equal to or better than original condition at the completion of the Project.

2. Where damage occurs, and cannot be repaired or replaced, the Contractor shall purchase and install new material to the satisfaction to the Engineer.

3. Drawings and/or specifications cover and govern replacement and restoration of foreseeable damage.

B. Removal of Water:

1. As specified in Section 31 23 19, Dewatering.

2. At all times during construction provide and maintain ample means and devices with which to remove promptly and dispose of properly all water entering the excavations or other parts of the Work.

3. Keep all excavations dry until the utilities or vaults to be placed therein are completed. In water bearing sand, well points and/or sheeting shall be supplied, together with pumps and other appurtenances of ample capacity to keep the excavation dry as specified.

4. Dispose of water from the Work in a suitable legal manner without damage to adjacent property or structures.

C. Trench Protection:

1. Provide the materials, labor and equipment necessary to protect trenches at all times.

2. Trench protection shall provide safe working conditions in the trench and protect the Work, existing property, utilities, pavement, etc.

3. The method of protection shall be according to the Contractor's design.

4. The Contractor may elect to use a combination of shoring, overbreak, tunneling, boring, sliding trench shields, or other methods of accomplishing the work provided the method meets the approval of all applicable local, state and federal safety codes.

5. Damages resulting from improper shoring, improper removal of shoring or from failure to shore shall be the sole responsibility of the Contractor.

3.4 LINES AND GRADES

A. Trench excavation for piping, utility vaults and other utilities shall be performed to the alignment and grade as indicated in the Drawings.

B. Where grades are not shown in the Drawings, utilities shall be laid to grade between control elevations shown.

C. Transmission water mains shall be installed with a minimum cover of 60 inches.

D. The Engineer reserves right to make changes in lines, grades and depths of utilities when changes are required for Project conditions.

E. Changes in the grade and horizontal alignment of the pipeline as shown in the Drawings or as provided elsewhere in the Specifications may be necessary due to unanticipated interferences or other reasons.

1. No additional compensation will be allowed the Contractor for changes in horizontal alignment.

2. No additional compensation will be allowed for changes in grade which require additional depth of trench excavation and backfill up to 2 feet from those shown in the Drawings.

F. Use laser-beam instrument with qualified operator to establish lines and grades.

3.5 OBSTRUCTIONS

A. Obstructions to the construction of the trench, such as tree roots, stumps, abandoned pilings, abandoned buildings and concrete structures, logs, rubbish, and debris of all types shall be removed without additional compensation from the Owner.

B. The Engineer may, if requested by the Contractor or Owner, make changes in the trench alignment to avoid major obstructions if such alignment changes can be made within the perpetual easement and right-of-way and without adversely affecting the intended function of the facility or increasing costs to the Owner.

3.6 INTERFERING ROADWAYS AND STRUCTURES

A. Remove, replace and/or repair any damage done during trenching activities to fences, buildings, cultivated fields, drainage crossings, and any other properties without additional compensation from the Owner.

1. Replace or repair these structures to a condition as good as or better than their pre-construction condition prior to commencing work in the area.

B. Paved Roadways:

1. Where paved roadways are cut as part of trenching activities, Class D trench backfill will be required to the bottom of pavement base.

2. New pavement shall be equal to or better than the existing paved surface.

3. New surface shall not deviate by more than 1/4-inch from the existing finish elevation.

C. Existing Structures:

1. If existing structures are encountered as part of trenching activities which will prevent construction and are not adequately shown in the Drawings, the Contractor shall notify the Engineer before continuing with the Work.

2. The Engineer may make such field revisions to the utility alignment as necessary to avoid conflict with the existing conditions.

3. The cost of waiting or "down time" during such field revisions shall be borne by the Contractor without additional cost to the Owner or liability to the Engineer.

4. If the Contactor fails to so notify the Engineer when a conflict of this nature is encountered, but proceeds with construction despite this interference, the Contractor shall do so at the Contractor's own risk with no additional payment.

3.7 TRENCHING

A. Excavate subsoil as required for construction of utilities to elevations shown in the Drawings.

B. Remove boulders and rock up to 1/2 cubic yard measured by volume per the requirements of this Section. Remove larger boulders and rock material as specified in Section 31 23 18, Rock Removal.

C. Open Trench Limit:

1. Do not advance open trench beyond the distance which will be backfilled and compacted the same day.

2. A maximum length of open trench shall not exceed 100 feet at any one time.

3. Temporary resurfacing shall be completed within 300 feet of the associated open trench limit for each main pipe laying operation.

4. Cover or backfill excavations at the end of each day.

5. If the trench is not backfilled at the end of each working day:

    a. Provide means to prevent caving of excavation sides, as necessary, during non-working hours.

    b. Cover the excavation with a system as needed to provide public safety and prevention of entry during non-working hours.

    c. Provide signed and stamped submittal of caving prevention system and cover system.

6. New trenching shall not be started when earlier trenches need backfilling or the surfaces of streets or other areas need to be restored to a safe and proper condition.

D. Utility Crossings: Avoid horizontal and vertical conflicts with existing utilities.

1. Perform excavation within 24 inches of existing utility service in accordance with utility's requirements.

2. Vertical clearance between the new pipe and existing utilities shall be 12 inches minimum, unless otherwise noted on the Drawings.

3. Where existing utility lines are damaged or broken during trenching activities, the utility shall be repaired or replaced. For water or sewer bearing lines, care being taken to insure a smooth flow line and absolutely no leakage at the new joints.

4. All expenses involved in the repair or replacement of leaking or broken utility lines that have occurred due to the Contractor's operations shall be borne by the Contractor, and the amount thereof shall be absorbed in the unit prices of its bid.

E. Water Lines Crossing Sewer Lines: Whenever water lines cross sewer lines, the Contractor shall comply with local Health Department requirements.

1. Wherever possible, the bottom of the water line shall be 18 inches or more above the top of sewer pipe. One full length of the water line pipe shall be centered at the crossing.

2. For clearances less than 1.5 feet, the Contractor shall replace the existing sewer pipe with ductile iron or PVC of equal size, centered at the utility crossing, or shall encase existing sewer pipe with concrete for a minimum of 10 feet on both sides of crossing, as directed by the Engineer, at no additional cost to the Owner.

F. Excavate trenches to width and depth as indicated on Drawings. No additional payment will be provided for trenching activities beyond dimensions shown in the Drawings.

1. Excavation for trenches in which pipelines are to be installed shall provide adequate space for workers to place and joint the pipe properly and safely, but in every case the trench shall be kept to a minimum width.

2. The width of the pipe trench at and below the top of the pipe shall be such that the clear space between the barrel of the pipe and the trench shall not exceed 18 inches on either side of the pipe.

3. Excavation for utility vaults and other structures shall be wide enough to provide 18 inches between the structure surface and the sides of the excavation.

4. For pipe or utility vaults to have bedding material, excavate to a depth of 6 inches below the bottom of the pipe or utility vault. Care shall be taken not to excavate below depths required.

5. If over digging occurs, the trench bottom shall be filled to grade with compacted bedding material.

G. Remove water or materials that interfere with Work.

1. The trench at all times shall be kept free from water to facilitate fine grading, the proper laying and joining of pipe, and prevention of damage to completed joints.

2. Adequate pumping equipment shall be provided to handle and dispose of the water without damage to adjacent property.

3. Water in the trench shall not be allowed to flow through the pipe while construction work is in progress unless special permission to do so has been given by the Engineer.

4. A suitably sized pipe plug shall be provided to prevent the entrance of objectionable material into the pipe, and plug shall be installed in the open end of the pipe trench whenever the work allows.

5. Remove and dispose of existing abandoned sewer pipe, structures, and other facilities as necessary to construct the improvements.

    a. Where the excavation activities require the removal of portions of an abandoned pipeline, masonry plugs shall be installed in the open ends of the pipe, unless otherwise noted in the Drawings or by the Engineer.

    b. Coordinate with Engineer prior to plugging.

    c. For plugs less than 36 inches in diameter, 8-inch deep masonry units shall be used. For plugs in larger pipelines, 12-inch deep masonry units shall be used.

6. The costs associated with the removal of water and materials noted above will be considered incidental to trench excavation and backfill.

H. Do not interfere with 45 degree bearing splay of foundations.

I. Overexcavation for Unsuitable Trench Foundation Conditions:

1. Cross-sectional dimensions and depths of excavations shown in the Drawings shall be subject to such changes as may be found necessary by the Engineer to secure foundations free from soft, weathered, shattered and loose material or other objectionable materials.

2. Unsuitable materials shall be removed and replaced only as directed in writing by Engineer.

3. Unsuitable materials encountered shall be removed and replaced with Coarse Aggregate Type A1, 2-1/2 inch – 0 gradation, as specified in Table 310516-A of Section 31 05 16, Aggregates for Earthwork. All material placed shall be compacted to 95 percent of maximum dry density.

4. Install nonwoven geotextile under trench stabilization material, over the soft or yielding excavated surface.

a. Install the nonwoven geotextile ahead of placement of the trench stabilization material, continuously along the excavation bottom and centered on the pipe centerline.

b. Use nonwoven geotextile width equal to the pipe diameter plus 2 feet.

c. Place laps or splices in the geotextile in the direction of the pipe laying.

J. Trim excavation. Hand trim for bell and spigot pipe joints. Remove loose matter.

K. Excavated material shall be placed at locations and in such a manner that it does not create a hazard to pedestrian or vehicular traffic, or interfere with the function of existing drainage facilities or system operation.

L. Remove excess subsoil not intended for reuse from site.

M. Stockpile excavated material in designated areas in accordance with Section 31 05 13, Soils for Earthwork.

3.8 TUNNELING

A. In lieu of open cut trenching as specified above, the Contractor may utilize tunnel methods for installation of pipe where ground conditions are favorable and such methods will not disturb foundations under curbs, sidewalks and other structures.

1. The Engineer must approve tunneling methods prior to utility installation.

2. Where tunneling is used, payment for the pipe installation will be made for the equivalent trench excavation and backfill as if the open cut method was used. Payment will not be made for surface restoration including pavement, curbs, sidewalks and other surface improvements whose replacement is avoided by the tunneling method.

3.9 SHEETING AND SHORING

A. Sheet, shore, and brace excavations to prevent danger to persons, new and existing structures, and adjacent and neighboring properties and to prevent caving, erosion, settlement, and loss of surrounding subsoil.

B. Support trenches more than 5 feet deep excavated through unstable, loose, or soft material. Provide sheeting, shoring, bracing, or other protection to maintain stability of excavation.

C. Repair damage caused by failure of the sheeting, shoring, or bracing and for settlement of filled excavations or adjacent soil.

D. Repair damage to new and existing Work from settlement, water or earth pressure or other causes resulting from inadequate sheeting, shoring, or bracing.

E. Design sheeting and shoring to be removed at completion of excavation work, unless shown otherwise in the Drawings.

F. Construction Sheeting Left in Place:

1. Furnish, install, and leave in place construction sheeting and bracing when specified or when indicated or shown on the Drawings.

2. Construction sheeting and bracing originally intended for temporary installation, placed by the Contractor to protect adjacent and neighboring structures, may be left in place if desired by the Contractor and approved by the Engineer. All such sheeting and bracing left in place shall be included in the cost for excavation.

3. Any construction sheeting and bracing which the Contractor has placed to facilitate its work may be ordered in writing by the Engineer to be left in place. The right of the Engineer to order sheeting and bracing left in place shall not be

construed as creating an obligation on its part to issue such orders. Failure of the Engineer to order sheeting and bracing left in place shall not relieve the Contractor of its responsibility under the contract.

4. For sheeting and shoring to be left in place as part of the completed Work, cut off minimum 18 inches below finished grade.

3.10 COMPACTION

A. Testing will be required to show specified densities of compacted backfill are being achieved by the Contractor's compaction methods.

B. Moisture Control:

1. Moisture condition backfill material to within 2 percent of optimum moisture content required for compaction throughout each lift of the fill.

2. Add moisture to granular backfill by sprinkling during compaction operation.

3. Compaction by ponding or jetting is not permitted.

C. Compact all materials and areas that are not accessible for in-place density testing, as determined by the Engineer, in place by whatever equipment and method is practicable or specified, and as approved by the Engineer.

1. Perform compaction at such moisture content as is required to produce well-filled, dense, and firm material in place that will show no appreciable deflection or reaction under the compacting equipment.

3.11 BEDDING

A. All utility vaults, potable water pipe 4-inch nominal diameter and over, all steel pipe, all concrete sewer pipe, all plastic pipe, all pipe under existing or future structures or roadways, and any and all utilities at a depth greater than 6 feet shall be laid in pipe bedding material.

B. Unless otherwise noted in the Drawings, pipe or conduit of less than 4-inch diameter, outside structure lines and at a depth of less than 6 feet shall be bedded in native material properly shaped as specified below, all as detailed on the Drawings.

C. Compacted bedding material shall be placed the full width of the excavated trench to a depth as shown on the trench detail included in the Drawings.

1. In lieu of a detail, the depth shall be 6 inches.

D. Spread the bedding smoothly over entire width of trench to the proper grade so that the pipe is uniformly supported along the barrel.

E. Hand grade and compact each lift to provide a firm, unyielding surface along the entire pipe length. For rigid pipe, compact to at least 90 percent relative compaction.

F. Excavate bell holes at each joint to permit proper assembly and inspection of the joint.

G. Check grade and correct irregularities in bedding material.

H. Center pipes horizontally in trench width.

3.12 BACKFILLING

A. Backfill trenches to contours and elevations with unfrozen fill materials.

B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.

C. Maintain optimum moisture content of fill materials to attain required compaction density.

D. Place fill material, with the exception of CLSM, in continuous layers and compact in 6 to 8-inch lifts.

1. Prevent pipe from moving either horizontally or vertically during placement and compaction of pipe zone material.

2. Where trenches are under existing or future structures, paved areas, road shoulders, driveways or sidewalks, or where designated on the Drawings or specified elsewhere in these specifications, the trench backfill shall be Class B or Class E and pipe zone backfill shall be Class B or Class E. Class B backfill shall be compacted to 95 percent of maximum density at optimum moisture content.

3. Where trenches are outside existing or future structures, paved areas, road shoulders, driveways or sidewalks, or where designated on plans or specified elsewhere, the trench backfill shall be Class A and pipe zone backfill in these areas shall be Class B. For these locations, compaction of Class B backfill shall be to not less than 90 percent of maximum density at optimum moisture content. Class B backfill shall be compacted to not less than 95 percent of maximum density at optimum moisture content.

E. Employ placement method that does not disturb or damage nearby or adjacent foundation perimeter drainage or utilities in trench.

F. Do not use power-driven impact compactors to compact pipe zone material.

G. Backfill Immediately: All trenches and excavations shall be backfilled immediately after pipe or conduit is in approved condition to receive it and shall be carried to completion as rapidly as possible, unless otherwise directed by the Engineer.

H. Under no circumstances shall water be permitted to rise in open trenches after pipe has been placed.

I. Do not allow backfill material 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.

J. Use hand compactors for compaction until at least 2 feet of backfill is placed over top of pipe. 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.

K. Placement of Sand:

1. Place medium sand in lifts not exceeding 8 inches in uncompacted thickness.

2. Compact each lift to a minimum of 95 percent relative compaction prior to placing succeeding lifts.

L. Placement of CLSM:

1. Discharge from truck-mounted drum-type mixer into trench.

2. Place in lifts not exceeding 2 feet in thickness.

3. No compaction of CLSM is allowed.

4. Use steel plates to protect the CLSM from traffic a minimum of 24 hours. After 24 hours, the CLSM may be paved, or opened to traffic until permanent surface restoration is completed, if it has hardened sufficiently to prevent rutting.

M. New trenching shall not be started when earlier trenches need backfilling or the surfaces of streets or other areas need to be restored to a safe and proper condition.

N. Do not leave trench open at end of working day.

3.13 MARKING TAPE INSTALLATION

A. Continuously install marking tape along centerline of all buried piping, install 24 inches below finished grade. Coordinate with piping installation drawings.

3.14 ELECTRONIC LOCATING FACILITY INSTALLATION

A. Marker Balls:

1. Install according to manufacturer's recommendations and as shown or directed and according to the following requirements:

   a. Install marker balls directly above the pipe alignment at a depth no less than 3 feet and no more than 4.5 feet below final surface grade.

   b. Install marker balls during trench backfill operations by placing the marker ball in compacted backfill.

   c. Cover marker ball with a minimum of 6 inches of backfill and compact backfill before continuing trench backfill operations.

   d. Install markers balls with trenchless pipe installations by core-drilling hole of a minimal diameter needed to allow clearance for placement of marker ball. Backfill with approved trench backfill, pavement base and pavement, as applicable.

2. Water Marker Ball Locations: Install at locations as required by Sewer Marker Ball Locations specified herein.

3. Sewer Marker Ball Locations:

   a. Install marker balls directly above connection points, termination points and all fitting locations, and at a minimum spacing of 50 linear feet on sewers with a straight horizontal alignment.

   b. Install marker balls at a minimum spacing of 25 lineal feet directly above sewer mains installed on a radius.

   c. Install marker balls on new or reconstructed sewer service laterals, directly above the centerline of the end of the lateral at the curb, property line or other end of lateral location, as directed.

   d. Install marker balls directly above every alignment change along sewer mains and service laterals.

   e. Install marker balls directly above manholes for manholes with buried covers.

B. Tracer Wire and Terminal Appurtenances:

1. Tracer Wire:

a. Install as shown or directed directly over the pipe centerline and on top of the pipe zone in all sewer trenches, including mainline sewers, service laterals and storm sewer inlet leads.

b. Connect mainline and service lateral tracer wires using either an approved direct-bury lug connector or direct-bury twist connector.

c. Extend tracer wire to locator stations in manholes, locator boxes, storm inlets, or other visually identifiable terminal appurtenances, allowing for access with electronic locating equipment, as shown or directed and according to the following requirements:

2. Locator Stations:

a. Install locator stations as shown within manholes.

b. Mount locator station to manhole wall within 18 inches of manhole rim with two stainless steel expansion anchors.

c. Drill a minimum 3/8-inch diameter hole through the manhole wall within 18 inches of the finish grade of the manhole rim.

d. Extend the tracer wire from the pipe trench in one continuous piece up the outside of the manhole and through the hole and into a locator station, and attach to one of the lugs in the locator station.

e. When multiple tracer wires are terminated in manhole install a multilead locator station.

f. Extend a ground wire from the locator station through a minimum 3/8-inch diameter hole in the manhole wall.

g. Install ground wire approximately 3 feet deep, and extend from the outside manhole wall a minimum of 3 feet horizontally in any direction.

h. Seal all holes drilled in manhole walls with silicone sealant.

3. Storm Inlet Tracer Wire Termination: Terminate tracer wire inside inlet and directly over storm outlet pipe by placing tracer wire as follows:

a. Drill a minimum 3/8-inch diameter hole through inlet wall to pass tracer wire through to inside inlet wall.

b. Seal hole with silicon sealer or material approved by Engineer.

c. Leave 6 inches of coiled tracer wire along inside of inlet wall approximately 3 inches below the inlet frame and grate or as directed by Engineer.

4. Service Lateral Tracer Wire Termination: Terminate tracer wire at ends of service laterals as shown or directed, as follows:

a. Termination in Tracer Wire Locate Boxes: Extend the tracer wire in one continuous piece up vertically from the pipe trench and into the bottom of the locate box. Leave 18 inches of coiled tracer wire inside locate box.

b. Termination at 2-inch by 4-inch Markers: Extend tracer wire in one continuous piece directly up service lateral 2-inch by 4-inch markers and leave 18 inches of tracer wire wrapped around the exposed top end of 2-inch by 4-inch marker.

3.15 VISUAL IDENTIFICATION FACILITIES

A. Tracer Wire Locate Boxes: Install tracer wire locate boxes directly over service laterals at property line, service boundary, or other location as shown or directed by the Engineer.

B. Service Lateral Plastic or Copper Markers:

1. Install plastic or copper markers in the concrete curb directly over the centerline of the service lateral, as shown or directed by the Engineer.

2. Either plastic or copper markers may be used.

3. If there is not suitable concrete curb for marker placement, then install a lateral cleanout as close to property line as practical at location approved by Engineer.

C. Service Lateral 2-inch by 4-inch Markers:

1. Place a 2-inch by 4-inch marker at the end of each new service lateral not connected to a building sewer.

2. Omit markers only as approved.

3. Block the capped or plugged service lateral end with a wood block against undisturbed earth and install the marker.

4. Extend the marker from the blocked service lateral invert to at least 12 inches above the existing or proposed finish ground surface.

5. Install marker in one piece. No splicing will be accepted.

6. Paint the exposed portion of the marker after its installation with quality quick drying enamel white paint for a storm only sewer and green paint for a sanitary or combined sewer.

7. After the paint has dried, use black, quick drying enamel, and neatly indicate the distance from the ground surface to the top of the service lateral in feet and inches.

8. Do not disturb the position and location of the marker during the backfilling operation.

9. If the marker is broken, moved out of location, or vertical alignment is changed during the backfilling operation, reopen the trench and replace the marker.

3.16 FIELD QUALITY CONTROL

A. All testing and reporting shall be conducted and completed by an independent laboratory provided by the Owner. Testing will be paid for by the Contractor.

B. Perform laboratory material tests in accordance with ASTM D698 (AASHTO T99).

C. In-place compaction testing of pipeline backfill materials shall be performed at 2-foot elevation increments, one test per 200 lineal feet of pipeline trench as measured along pipe centerline.

1. The Engineer may reduce the frequency when satisfied with method of compaction.

2. The Engineer may direct testing at a higher frequency at no additional cost to the Owner upon failure to obtain specified densities or if the Contractor changes compaction equipment or methods of compaction.

3. The Engineer shall determine all test locations.

D. Perform in place compaction tests in accordance with the following:

1. Density Tests: ASTM D2922.
2. Moisture Tests: ASTM D3017.

E. When tests indicate Work does not meet specified requirements, remove Work, replace and retest at the sole expense of the Contractor.

3.17 SURFACE RESTORATION AND CLEANUP

A. Open Trenches: At the end of each work day, all open trenches shall be backfilled and all trenches within streets shall be temporarily paved or covered to the satisfaction of the Engineer and the local permitting agency.

1. Temporary paving shall be replaced with permanent street paving at the completion of construction within street rights-of-way, or sooner, if deemed necessary by the ENGINEER.

2. No gravel-filled trenches shall be left open within the street right-of-way at the end of the workday.

B. Topsoil:

1. Where trenches cross lawns, garden areas, pastures, cultivated fields, or other areas on which reasonable topsoil conditions exist, remove the topsoil to the specified depth and place the material in a stockpile.

2. Topsoil shall not be mixed with other excavated material.

3. After the trench has been backfilled, the topsoil shall be replaced.

C. Steep Slopes:

1. For the steep sloping section of the alignment north of the reservoir, once backfilled, areas disturbed by trenching shall be immediately seeded with a seed mix to control erosion as specified in Section 32 91 21, Finish Grading and Seeding.

D. Clean up and remove all excess materials, construction materials, debris from construction, etc. Replace or repair any fences, mailboxes, signs, landscaping, or other facilities removed or damaged during construction. Replace all lawns, topsoil, shrubbery, flowers, etc., damaged or removed during construction. The Contractor shall be responsible for seeing that lawns, shrubs, etc. remain alive and leave premises in condition equal to original condition before construction.

END OF SECTION

SECTION 31 23 18

ROCK REMOVAL

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes removal of subsurface rock during excavation by mechanical method. The use of explosives for rock removal is not permitting for this project.

B. Section Includes:

1. Removing identified and discovered rock during excavation.
2. Expansive tools to assist rock removal.

C. Related Sections:

1. Section 31 22 13 - Rough Grading.
2. Section 31 23 16 - Excavation: Building excavation.
3. Section 31 23 17 - Trenching: Trenching and backfilling for utilities.
4. Supplemental Information: Geotechnical report; bore hole locations and findings of subsurface materials.

1.2 DEFINITIONS

A. Common Excavation: All excavation required for Work, regardless of the type, character, composition or condition of the material encountered. All excavation shall be classified as Common Excavation, unless provided for under Rock Removal below.

B. Common Material: All soils, aggregate, debris, junk, broken concrete, and miscellaneous material encountered in Common Excavation, excluding rock as defined below.

C. Rock: Solid mineral material, including boulders, solid bedrock, or ledge rock, with volume in excess of 1/2 cubic yard or solid material which, by actual demonstration, cannot be reasonably excavated with suitable machinery as defined herein. The Engineer may waive the requirements for actual demonstration if the material encountered is well-defined rock.

D. Rock Removal: Removal of rock as defined herein by systematic and continuous drilling, hammering, breaking, splitting or other methods approved by the Engineer.

E. Suitable Machinery: A track-mounted hydraulic excavator of the 52,800 to 72,500-pound class equipped with a single shank ripper.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Shop Drawings: Indicate proposed method of rock removal.

C. Equipment: Manufacturer information regarding pound class of machinery proposed for rock removal.

D. Survey Report: Submit survey report mapping extent and locations of rock encountered, to be used in calculating total volume of rock removal.

1.4 PROJECT CONDITIONS

A. Conduct survey of rock uncovered in excavation for structures or trenching for utilities prior to removal of material.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify site conditions and note subsurface irregularities affecting Work of this section.

3.2 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Engineer Approval for Rock Removal:

1. Prior to commencement of rock removal, expose all material anticipated to be rock by removing the common material above it and then notify the Engineer.

2. The Engineer, in association with the Contactor or the Contractor's representative, will measure the amount of material to be removed in an effort to reach a mutually agreeable volume for anticipated rock removal.

3. Prior to commencing the proposed rock removal, the Contractor must receive written approval by the Engineer stating the approximate volume of excepted rock removal to receive payment.

4. During rock removal activities, should it become apparent the previously agreed upon volume of rock removal will be exceeded, notify the Engineer immediately.

Should the Contractor proceed with rock removal in excess of the previously agreed upon volume, the Contractor will do so at their own risk and expense.

3.3 ROCK REMOVAL BY MECHANICAL METHOD

A. Excavate and remove rock by mechanical method.

1. Use single shank ripper to fracture rock.
2. Drill holes and use expansive tools and wedges to fracture rock.

B. Cut away rock at bottom of excavation to form level bearing.

C. Remove shaled layers to provide sound and unshattered base for footings and foundations.

D. In utility trenches, excavate to 6 inches below invert elevation of pipe and 24 inches wider than pipe diameter.

E. For vaults and other structures, excavate to the depth necessary to install the structure and to a maximum of 18 inches beyond the outside walls of the vault or structure.

F. Remove excavated materials from site.

G. Correct unauthorized rock removal associated with structural excavations in accordance with backfilling and compacting requirements of Section 31 23 16, Excavation and as directed by Engineer.

H. Correct unauthorized rock removal associated with utility work in accordance with backfilling and compacting requirements of Section 31 23 17, Trenching and as directed by Engineer.

I. If material which would be classified as rock as defined herein is mechanically removed with equipment of a larger size than specified as Suitable Machinery herein, it shall be understood that any added costs for the removal of rock by this method shall be included in the unit price for common excavation and not paid for under this pay item. If material which would be classified as rock as defined herein is mechanically removed without [blasting,] hammering, breaking or splitting, it will be considered common excavation and not paid for under this pay item. If equipment larger than the suitable machinery as defined herein is brought on the project site for the sole purpose of rock removal without hammering, breaking or splitting, then such excavation will be considered rock removal.

3.4 FIELD QUALITY CONTROL

A. Request visual inspection of foundation bearing surfaces by Engineer before installing subsequent work.

END OF SECTION

SECTION 31 23 19

DEWATERING

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes temporary dewatering and surface water control systems for open excavations and utility trenches.

B. Section includes:

1. Dewatering systems.
2. Surface water control systems.
3. System operation and maintenance.
4. Water disposal.

1.2 RELATED SECTIONS

A. Section 02 30 00 - Subsurface Investigations.
B. Section 31 05 16 - Aggregates for Earthwork.
C. Section 31 23 16 - Excavation.
D. Section 31 23 17 - Trenching.

1.3 SUBMITTALS

A. Dewatering Plan:

1. Descriptions of proposed groundwater and surface water control facilities including, but not limited to, equipment; methods; standby equipment and power supply; pollution control facilities; discharge locations to be utilized; and provisions for immediate temporary water supply as required by this Section.

2. Plan to be reviewed by the Engineer prior to the beginning of construction activities requiring dewatering. Review by the Engineer of the design shall not be construed as a detailed analysis of the adequacy of the dewatering system, nor shall any provisions of the above requirements be construed as relieving the Contractor of its overall responsibility and liability for the work.

1.4 DEFINITIONS

A. Dewatering includes the following:

1. Lowering of ground water table and intercepting horizontal water seepage to prevent ground water from entering excavations, trenches, tunnels, and /or shafts.

2. Reducing piezometric pressure within strata to prevent failure or heaving of excavations, trenches, tunnels, and /or shafts.

3. Disposing of removed water.

B. Surface Water Control: Removal of surface water within open excavations.

1.5 QUALITY CONTROL

A. All dewatering operations shall be adequate to assure the integrity of the finished project and shall be the responsibility of the Contractor.

B. Provide all labor, materials, and equipment necessary to dewater trench and structure excavations, in accordance with the requirements of the Contract Documents.

C. Secure all necessary permits to complete the requirements of this Section.

D. Control the rate and effect of the dewatering in such a manner as to avoid all objectionable settlement and subsidence.

E. Where the critical structures or facilities exist immediately adjacent to areas of proposed dewatering, reference points shall be established and observed at frequent intervals to detect any settlement which may develop.

1. The responsibility for conducting the dewatering operation in a manner which will protect adjacent structures and facilities rests solely with the Contractor.

2. The cost of repairing any damage to adjacent structures and restoration of facilities shall be the responsibility of the Contractor.

PART 2 PRODUCTS

2.1 EQUIPMENT

Dewatering, where required, may include the use of well points, sump pumps, temporary pipelines for water disposal, rock or gravel placement, and other means. Standby pumping equipment shall be maintained on the jobsite.

PART 3 EXECUTION

3.1 DEWATERING

A. Provide all equipment necessary for dewatering.

1. Have on hand, at all times, sufficient pumping equipment and machinery in good working condition.

2. Have available, at all times, competent workers for the operation of the pumping equipment.

3. Adequate standby equipment shall be kept available at all times to insure efficient dewatering and maintenance of dewatering operation during power failure.

B. Dewatering for structures and pipelines shall commence when groundwater is first encountered, and shall be continuous until such times as water can be allowed to rise in accordance with the provisions of this Section or other requirements.

C. Site Grading:

1. At all times, site grading shall promote gravity drainage.

2. Surface runoff shall be diverted from excavations.

3. Water entering the excavation from surface runoff shall be collected in shallow ditches around the perimeter of the excavation, drained to sumps, and be pumped or drained by gravity from the excavation to maintain a bottom free from standing water.

D. Dewatering shall at all times be conducted in such a manner as to preserve the undisturbed bearing capacity of the subgrade soils at proposed bottom of excavation.

E. If foundation soils are disturbed or loosened by the upward seepage of water or an uncontrolled flow of water, the affected areas shall be excavated and replaced with drain rock.

F. Maintain the water level below the bottom of excavation in all work areas where groundwater occurs during excavation construction, backfilling, and up to acceptance.

G. Flotation shall be prevented by maintaining a positive and continuous removal of water. The Contractor shall be fully responsible and liable for all damages which may result from failure to adequately keep excavations dewatered.

H. If well points or wells are used, they shall be adequately spaced to provide the necessary dewatering and shall be sandpacked and/or other means used to prevent

pumping of fine sands or silts from the subsurface. A continual check shall be maintained to ensure that the subsurface soil is not being removed by the dewatering operation.

I. Dispose of water from the work in a suitable manner without damage to the environment or adjacent property. No water shall be drained into work built or under construction without prior consent of the Engineer. Water shall be filtered using an approved method to remove sand and fine sized soil particles before disposal into any drainage system.

J. The release of groundwater to its static level shall be performed in such a manner as to maintain the undisturbed state of the natural foundation soils, prevent disturbance of compacted backfill and prevent flotation or movement of structures, pipelines, and sewers.

K. Dewatering of trenches and other excavations shall be considered as incidental to the construction of the work and all costs thereof shall be included in the various contract prices in the bid forms.

END OF SECTION

SECTION 32 11 23

AGGREGATE BASE COURSES

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes construction of an aggregate subbase and base course for placement under asphalt or concrete paving, unit paving, or placed and left exposed.

B. Section Includes:

1. Aggregate subbase.
2. Aggregate base course.

1.2 RELATED REQUIREMENTS:

A. Section 31 22 13 - Rough Grading
B. Section 31 23 17 - Trenching
C. Section 31 05 16 - Aggregates for Earthwork
D. Section 32 12 16 - Asphalt Concrete Pavement

1.3 REFERENCE STANDARDS

A. Standard Specifications:

1. Where the term “Standard Specifications” is used, such reference shall mean the latest edition of the Oregon Department of Transportation (ODOT) Standard Specifications for Highway Construction.

2. Where reference is made to a specific part of the Standard Specifications, such applicable part shall be considered as part of this section of the Specifications.

3. In case of a conflict in the requirements of the Standard Specifications and the requirements stated herein, the requirements herein shall prevail.

B. American Association of State Highway and Transportation Officials (AASHTO):

1. AASHTO M288 - Standard Specification for Geotextile Specification for Highway Applications.

2. T11, Standard Method of Test for Materials Finer Than 75μm (No. 200) Sieve in Mineral Aggregates by Washing.

3. T27, Standard Method of Test for Sieve Analysis of Fine and Coarse Aggregates.

4. AASHTO T99 - Standard Specification for Moisture-Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in.) Drop.

C. ASTM International (ASTM):

1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).

2. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.

3. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

4. ASTM D2940 - Standard Specification for Graded Aggregate Material For Bases or Subbases for Highways or Airports.

5. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.4 DEFINITIONS

A. Completed Course: Compacted, unyielding, free from irregularities and standing water, with smooth, tight, even surface, true to grade, line, and cross-section.

B. Completed Lift: Compacted with uniform cross-section thickness.

C. Keystone: Fine aggregate used to aid in binding of loose surface stone.

1.5 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data:

1. Submit data for geotextile fabric and herbicide.

C. Materials Source: Submit name of aggregate materials suppliers.

D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.6 QUALITY ASSURANCE

A. Furnish each aggregate material from single source throughout the Work.

PART 2 PRODUCTS

2.1 SHOULDER AGGREGATE

A. Of the size shown on the Drawings.

B. Coarse Aggregate: Type A1, Dense-Graded Aggregate as specified in Section 32 05 16, Aggregates for Earthwork.

2.2 DENSE-GRADED BASE AGGREGATES

A. Of the size shown on the Drawings.

B. Coarse Aggregate: Type A1, Dense-Graded Aggregate as specified in Section 32 05 16, Aggregates for Earthwork.

2.3 OPEN-GRADED BASE AGGREGATES

A. Of the size shown on the Drawings.

B. Coarse Aggregate: Type A2, Granular Drain Backfill Material as specified in Section 32 05 16, Aggregates for Earthwork.

2.4 SOURCE QUALITY CONTROL

A. Perform tests necessary to locate acceptable source of materials meeting specified requirements.

B. Final approval of aggregate material will be based on test results of installed materials.

C. Should separation of coarse from fine materials occur during processing or stockpiling, immediately change methods of handling materials to correct uniformity in grading.

2.5 EQUIPMENT

A. Compaction Equipment: Adequate in design and number to provide compaction and to obtain specified density for each layer.

2.6 ACCESSORIES

A. Geotextile Fabric: AASHTO M288; non-woven, polypropylene.

PART 3 EXECUTION

3.1 SUBGRADE PREPARATION

A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting subgrade.

B. Verify compacted substrate is dry and ready to support paving and imposed loads.

1. Proof roll substrate with equipment approved by the ENGINEER in minimum two perpendicular passes to identify soft spots.

2. Remove and replace soft substrate with compacted fill as determined via proof roll. Substrate shall be considered soft if any deflection is observed during proof roll.

C. Subgrade Geotextile: Place between substrate and aggregate base course in accordance to manufacturer's recommendations.

D. Do not place base course or surfacing materials in snow or on soft, muddy, or frozen subgrade.

E. Obtain Engineer's acceptance of subgrade before placing base course or surfacing material.

F. Verify compacted substrate is dry and ready to support paving and imposed loads.

1. Proof roll substrate with equipment approved by the Engineer in minimum two perpendicular passes to identify soft spots.

3.2 HAULING AND SPREADING

A. Hauling Materials:

1. Do not haul over surfacing in process of construction.

2. Loads: Of uniform capacity.

3. Maintain consistent gradation of material delivered; loads of widely varying gradations will be cause for rejection.

B. Spreading Materials:

1. Distribute material to provide required density, depth, grade, and dimensions with allowance for subsequent lifts.

2. Produce even distribution of material on prepared surface without segregation.

3. Should segregation of coarse from fine materials occur during placing, immediately change methods of handling materials to correct uniformity in grading.

4. Maintain consistent gradation of material. Widely varying gradation will be cause for rejection.

3.3 CONSTRUCTION OF COURSES

A. Untreated Aggregate Base Course:

1. If the required compacted depth of the base course exceeds 6 inches, construct it in two or more layers of nearly equal thickness. The maximum compacted thickness of any one layer shall not exceed 6 inches.

2. Completed Course Total Thickness: As shown on the Plans, 8-inch minimum.

3. Spread lift on preceding course to required cross-section. Place each layer in spreads as wide as practical and to the full width of the course before a succeeding layer is placed.

4. Lightly blade and roll surface until thoroughly compacted.

5. Add keystone to achieve compaction and as required when aggregate does not compact readily due to lack of fines or natural cementing properties, as follows:

a. Use 3/4-inch leveling course or surfacing material as keystone.

b. Spread evenly on top of base course, using spreader boxes or chip spreaders.

c. Roll surface until keystone is worked into interstices of base course without excessive displacement.

d. Continue operation until course has become thoroughly keyed, compacted, and will not creep or move under roller.

6. Blade or broom surface to maintain true line, grade, and cross-section.

B. Gravel Surfacing and Leveling Course:

1. Place shoulder aggregates in a single layer, or two or more layers of nearly equal thickness. The maximum compacted thickness of any one layer shall not exceed 9 inches.

2. Spread on preceding course in accordance with cross-section shown.

3. Blade lightly and roll surface until material is thoroughly compacted.

4. Complete Total Thickness: As shown on the Plans, 8-inch minimum.

3.4 ROLLING AND COMPACTION

A. Commence compaction of each layer of base immediately after spreading operations and continue until density of 95 percent of maximum density has been achieved as determined by AASHTO T99.

B. Roll each layer of material until there is no appreciable reaction or yielding under the compactor before succeeding layer is applied.

C. Shape and maintain the surface of each layer during compaction operations. Commence rolling at outer edges and continue toward center; do not roll center of road first.

D. Apply water as needed to obtain specified densities.

E. Place and compact each lift to the required density before succeeding lift is placed.

F. Surface Defects: Remedy by loosening and rerolling. Reroll entire area, including surrounding surface, until thoroughly compacted.

G. Finished surface shall be true to grade and crown before proceeding with surfacing.

3.5 SURFACE TOLERANCES

A. Blade or otherwise work surfacing as necessary to maintain grade and cross-section at all times, and to keep surface smooth and thoroughly compacted.

B. Finished Surface of Untreated Aggregate: Within plus or minus 0.04 foot of grade shown at any individual point.

C. Overall Average: Within plus or minus 0.04 foot from crown and grade specified.

3.6 FIELD QUALITY CONTROL

A. Quality control testing shall be performed by an independent testing laboratory provided by the Contractor.

B. Refer to table below for minimum sampling and testing requirements for aggregate base course and surfacing. The OWNER reserves the right to complete additional testing.

Property	Test Method	Frequency	Sampling Point
Gradation	AASHTO T11 and AASHTO T27	One sample every 500 tons but at	Roadbed after processing

Property	Test Method	Frequency	Sampling Point
		least every 4 hours of production	
Moisture Density (Maximum Density)	AASHTO T99	One test for every aggregate grading produced	Production output or stockpile
In-Place Density and Moisture Content	AASHTO T310	One for each 500 ton but at least every 10,000 square feet of area	In-place completed, compacted area

3.7 CLEANING

A. Remove excess material from the Work area. Clean stockpile and staging areas of all excess aggregate. Restore per Specifications as applicable.

END OF SECTION

SECTION 32 12 16

ASPHALT CONCRETE PAVEMENT

PART 1 GENERAL

1.1 SCOPE

This section includes the construction of asphalt concrete pavement.

1.2 REFERENCE STANDARDS

A. References herein to "AASHTO" shall mean Association of American State Highway Transportation Officials.

B. Standard Specifications: Where the term "Standard Specifications" is used, such reference shall mean the current edition of the Oregon Department of Transportation (ODOT) Standard Specifications for Highway Construction. Where reference is made to a specific part of the Standard Specifications, such applicable part shall be considered as part of this section of the Specifications. In case of a conflict in the requirements of the Standard Specifications and the requirements stated herein, the requirements herein shall prevail.

1.3 DEFINITIONS

A. Maximum Density Test (MDT): Theoretical maximum density of the bituminous mixture determined by multiplying the theoretical maximum specific gravity, determined by ASTM D2041 (Rice), by 62.4 pounds per cubic foot.

1.4 SUBMITTALS

A. Aggregate Qualification Tests: In accordance with Standard Specifications Section 00640 for aggregate used in aggregate base.

B. Aggregate Qualification Tests: In accordance with Standard Specifications Section 00745 for aggregate used in asphalt concrete.

C. Job mix formula shall be an approved job mix formula. Submit formula, supplier, and product identification to the Engineer 30 days prior to start.

1. Definite percentage for:

a. Each sieve fraction.
b. New asphalt cement.
c. Recycled asphalt pavement.

2. Temperature of completed mix when discharged from mixer.

3. Character and quantity of anti-strip and recycling agents.

1.5 QUALITY ASSURANCE

A. All testing to determine compliance with the specifications shall be performed by an independent testing laboratory contracted by the Contractor and approved by the Engineer. All testing costs shall be borne by the Contractor.

B. A minimum of five (5) nuclear densometer readings shall be taken in random locations within every test area. Each test area shall not exceed 200 tons of asphalt; however, smaller areas may be designated by the Engineer.

C. The surface smoothness of the new asphalt concrete pavement shall be such that when a 10-foot straightedge is laid longitudinally across the paved area in any direction, the new pavement shall not deviate from the straightedge more than 1/8 inch. Surface drainage shall be maintained. Additionally, paving must conform to the design grade and crown and contain no abrupt edges, low or high areas or any other imperfections as determined by the Engineer. Pavement construction not meeting these requirements will be repaired by grinding the existing pavement to a 1 1/2-inch depth and replacing with Level 2, ½ -inch dense graded Asphaltic Concrete the full width at no cost to Owner.

1.6 PRE-PAVING CONFERENCE

A. Any supervisory personnel of the Contractor and any subcontractors who are to be involved in the paving work shall meet with the Engineer, at a time mutually agreed upon, to discuss methods of accomplishing all phases of the paving work.

B. The Contractor shall be prepared to review the size and type of equipment to be used and the anticipated rate of placement to determine equipment needs.

PART 2 PRODUCTS

2.1 AGGREGATE MATERIAL

A. Aggregate Base for Dense Graded Asphalt Concrete: The aggregate material shall be a clean, well-graded crushed base aggregate conforming to the Standard Specifications. Base course shall be 1-1/2 inch minus aggregate and leveling course shall be 3/4-inch minus aggregate.

2.2 ASPHALT CONCRETE PAVEMENT

A. Dense Graded Hot Mix Asphalt Concrete

1. Use Level 2, ½ inch-dense graded, PG 64-22 HMAC. Conform to the requirements as specified in Section 00745 of the Standard Specifications. Conform to the requirements as specified in Section 00745 of the Standard Specification.

2. Asphaltic concrete pavement delivered to the site shall be accompanied by a ticket with the approved "job mix formula" number shown. Loads without tickets identifying the job mix formula will not be accepted.

3. Percent of recycled asphalt pavement used in new asphalt pavement shall not exceed 30 percent. Recycled asphalt pavement may not be used in top wearing course unless otherwise approved by the Engineer.

B. Tack Coat

In accordance with Standard Specifications. Use AR 4000, AC-20 asphalt or CSS-1 emulsified asphalt C.

C. Seal and Cover Coat

Asphalt material shall be CRS-2 cationic emulsified asphalt. Cover stone shall conform to size ¼ -inch -#10 aggregate in the Standard Specifications.

D. Subgrade Geotextile

1. Dense Graded AC Mix-For subgrade separation using dense graded asphalt concrete, use subgrade geotextile with Certification Level B as specified in Section 02320 of the Standard Specifications.

E. Subgrade Stabilization

In the event that unstable materials are encountered during excavation, the additional excavation and installation of geotextile fabric and twelve (12) inches of rock substructure will be required, as directed. Conform to the requirements as specified in Section 00331 of the Standard Specifications. For subgrade separation, use subgrade geotextile with Certification Level B as specified in Section 02320 of the Standard Specifications.

PART 3 EXECUTION

3.1 AGGREGATE PAVEMENT BASE

A. Place pavement base to the depth shown on the plans or as specified in all cases, pavement base shall be compacted to a minimum depth of 6 inches. Bring the top of the pavement base to a smooth, even grade at a distance below finished grade equivalent to the required pavement depth.

B. Compact the pavement base with mechanical vibratory or impact tampers to a density of not less than 95 percent of the maximum density, as determined by AASHTO T-99.

C. Obtain the Engineer's acceptance of the subgrade before beginning construction of the aggregate base course.

D. When, in the judgment of the Engineer, the weather is such that satisfactory results cannot be secured, suspend operations. Place no aggregate base course in snow or in soft, muddy, or frozen subgrade.

E. If the required compacted depth of aggregate base course exceeds six (6) inches, construct in two or more lifts of approximately equal thickness. Maximum compacted thickness of any one lift shall not exceed six (6) inches. Compact each layer to the specified density before a succeeding lift is placed.

3.2 ASPHALT CONCRETE PAVEMENT

A. Construct asphalt concrete pavement in accordance with Section 00745 of the Standard Specifications.

B. Conform to the requirements for prime coat and tack coat in the Standard Specifications. Tack coat all edges of existing pavement, manhole and clean out frames, inlet boxes and like items. When rate is not specified, asphalt will be applied at the rate of 0.1 gallon per square yard.

C. Obtain the Engineer's acceptance of the aggregate base course before beginning construction of the asphalt concrete wearing course.

D. Hot mix asphalt shall be placed on dry, prepared surfaces, when air temperature in the shade of 40^{o} F or warmer are observed for asphalt base lifts of 3" thickness and 50^{o} F or warmer for asphalt base lifts of less than 3" thickness, unless otherwise authorized by the Engineer.

E. Placing asphalt pavement during rain or other adverse weather conditions will not be permitted unless otherwise authorized by the Engineer, except that asphalt mix in transit at the time these adverse conditions occur may be placed provided it is of proper temperature, the mix has been covered during transit, and it is placed on a foundation free from mud or free-standing water.

F. Correct any defects in material and workmanship, as directed, when determined detrimental by the Engineer. These include segregation of materials, non-uniform texture, and fouled surfaces preventing full bond between successive spreads of mixture. The corrections or replacement of defective material or workmanship shall be at the Contractor's expense.

G. Compact the bituminous mixture to at least 92 percent of the Theoretical Maximum Density.

H. The finished surface of each course of layer of mixture shall be of uniform texture, smooth, and free of defects and shall closely parallel that specified for the top surface finished grade. Remove and replace boils and slicks immediately with suitable materials.

I. The surface of each layer when tested with a Contractor-furnished 10-foot straightedge shall not vary from the testing edge by more than 0.02-foot for underlying courses of pavements and 0.015-foot for finished top courses or wearing courses of pavements. At no point shall the finished top of the wearing course vary more than 0.03-foot from the specified finished grade.

J. Lift thickness shall be as shown on the drawings or specified, but not to exceed 3 inches.

K. Do not place asphalt concrete pavement on emulsified asphalt (tack coat) until the asphalt separates from the water (breaks) but before it loses its tackiness.

L. Asphalt and sand seal edges where new asphalt concrete meets existing pavement.

3.3 FIELD QUALITY CONTROL

A. Job mix will be sampled immediately behind the paving machine.

B. Temperature of the mix will be measured immediately behind the paver.

C. The theoretical maximum specific gravity of the bituminous mixture will be determined in accordance with ASTM D2041.

D. Properties of the job mix will be measured using ASTM D2041.

E. Density of the compacted job mix will be measured in accordance with ASTM D2922.

3.4 ADJUSTMENT OF EXISTING MANHOLE COVERS AND VALVE BOXES

Prior to placing asphalt concrete pavement, the CONTRACTOR shall make all necessary adjustments to existing manhole frames and covers and valve box covers to ensure that the tops of the manhole covers or valve box lids are flush with the finished grade of the adjoining pavement or ground surface, and that valve boxes and PVC pipes are centered and plumb over operating nut valve.

END OF SECTION

SECTION 32 31 13

CHAIN LINK FENCING AND GATES

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes chain link steel fencing and gates as shown on the Drawings or specified elsewhere. All fences and gates shall be furnished with top rails and knuckled periphery edges.

B. Section includes:

1. Chain link fabric.
2. Posts.
3. Rails.
4. Tension wires.
5. Braces.
6. Fittings.
7. Gates.
8. Lock assemblies and gate stops.

1.2 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Chain Link Fence Manufacturer's Institute:

1. Galvanized Steel Chain Link Fence Fabric.
2. Industrial Steel Specifications for Fence-Posts, Gates and Accessories.

B. ASTM International (ASTM):

1. A121, Standard Specification for Metallic-Coated Carbon Steel Barbed Wire.

2. A313, Standard Specification for Stainless Steel Spring Wire.

3. A392, Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric.

4. A491, Standard Specification for Aluminum-Coated Steel Chain-Link Fence Fabric.

5. A497, Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete.

6. A615, Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

7. A780, Standard Specification for Repair of Damaged and Uncoated Areas of Hot-Dipped Galvanized Coatings.

8. A824, Standard Specification for Metallic-Coated Steel Marcelled Tension Wire for Use with Chain Link Fence.

9. A1011, Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.

10. C94, Standard Specification for Ready-Mixed Concrete.

11. C150, Standard Specification for Portland Cement.

12. C387, Standard Specifications for Packaged, Dry, Combined Materials for Mortar and Concrete.

13. F552, Standard Terminology Relating to Chain Link Fencing.

14. F567, Standard Practice for Installation of Chain-Link Fence.

15. F626, Standard Specification for Fence Fittings.

16. F900, Standard Specification for Industrial and Commercial Swing Gates.

17. F1043, Standard Specification for Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework.

18. F1083, Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures.

19. F1183, Standard Specifications for Aluminum Alloy Chain Link Fence Fabric.

20. F1184, Standard Specifications for Industrial and Commercial Horizontal Slide Gates.

21. F1916, Standard Specification for Selecting Chain Link Barrier Systems with Coated Chain Link Fence Fabric and Round Posts for Detention Applications.

C. Conflicts in requirements shall use this Section to take precedence.

1.3 SUBMITTALS

A. Section 01 30 00, Submittal Procedures: Requirements for submittals.

B. Shop Drawings:

1. Product Data: Include construction details, material descriptions, dimensions of individual components, and finishes for chain link fences and gates.

2. Fence, gate posts, rails, and fittings.

3. Chain link fabric.

4. Gates and hardware.

C. Manufacturer's recommended installation instructions.

D. Evidence of Supplier and installer qualifications.

1.4 QUALITY ASSURANCE

A. Use skilled workers thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. Provide each type of steel fence and gate as a complete unit produced by a single manufacturer, including necessary erection accessories, fittings and fastenings.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Site in undamaged condition.

B. Store materials off the ground to provide protection against oxidation caused by ground contact.

PART 2 PRODUCTS

2.1 MATERIALS

A. Fabric

1. Continuous chain link fence.

2. Height: As shown on the Drawings.

3. Mesh: 2-inch. All mesh shall have knuckled periphery to eliminate sharp appendages.

4. #9 gauge steel core wire.

5. Top and bottom selvage: Knuckled finish.

6. Galvanized after weaving.

7. Zinc coating shall not be less than 0.9 ounces per square foot.

B. Line Posts

Line posts shall be hot dipped galvanized 2.375" O.D. hot dipped galvanized pipe, weighing 3.12 pounds per lineal foot.

C. Terminal Posts

End, corner and pull posts shall be hot dipped galvanized pipe 2.875 inches O.D. and weighing not less than 4.64 pounds per lineal foot.

D. Top Rail

1. Top rail shall be hot dipped galvanized 1.660 inch O.D. pipe, weighing 1.83 pounds per lineal foot.

2. Furnish in random lengths of approximately 20 feet.

3. Jointed using a pressed steel or malleable sleeve, not only allowing for expansion and contraction, but also providing a continuous brace from end to end of each stretch of fence.

E. Tension Wire

Bottom tension wire shall be #6 gauge heavy galvanized high carbon steel coil spring wire, securely fixed to the fabric, line posts and terminal posts.

F. Braces

1. All terminal posts shall be braced with 1.660 inch O.D. horizontal pipe bracing of the same material as the top rail, securely attached to the terminal and first line post with malleable iron fittings.

2. Braces shall be truss-braced from the first line post to the bottom of the terminal post, with a 3/8-inch galvanized truss rod assembly.

3. Corner posts shall be braced in both directions.

G. Fittings

1. Malleable, cast iron or pressed steel.

2. Hot dip galvanized.

H. Fabric Ties

1. #11 gauge galvanized wire ties shall be used to tie the fabric to the line posts and rails.

I. Chain Link Gates

1. Frames:

   a. Made of heavy galvanized 1.90 inch O.D. pipe, weighing 2.28 pounds per lineal foot.

   b. Welded or assembled with corner fittings.

2. Corner fittings, ball and socket hinges, catch stops and center rest to be heavy galvanized malleable iron.

3. Hinges as required.

4. Provide diagonal cross-bracing.

J. Gate Posts

Posts shall be hot dipped galvanized pipe 2.875-inch O.D. weighing 4.64 pounds per lineal foot.

K. Framework Material

All posts, rails and braces to be heavy galvanized.

L. Lock Assembly and Gate Stop

1. Provide for each gate one (1) double-hasp drive gate drop rod lock assembly set in concrete and one (1) gate stop set in concrete.

2. All lock assemblies and gate stops shall be fabricated from heavy galvanized malleable iron.

3. Provide one vandal-proof keyed lock and 3 keys for each gate assembly.

PART 3 EXECUTION

3.1 INSTALLATION

A. All materials and workmanship shall be first class in all respects and shall be done in a neat and workmanlike manner.

B. Installation shall be conducted in accordance with the requirements of the Chain Link Fence Manufacturers Institute and these Drawings & Specifications.

C. All line, terminal, gate stops, gate drop, and gate posts shall be fixed with a minimum of 3-foot embedment in concrete poured into a 1-foot diameter hole and plumb upon curing of the concrete.

D. Line posts shall be spaced not further than 10-foot on-center.

E. Gates shall have 3-inch clearance above ground surface and sized for the application shown.

F. Space ties at 14 inches on-center (O.C.).

END OF SECTION

SECTION 32 91 21

FINISH GRADING AND SEEDING

PART 1 GENERAL

1.1 SCOPE

A. This section includes finish grading, erosion control, and establishment of seeding, complete, including furnishing and delivery of labor, materials and equipment.

B. Section Includes:

1. Topsoil.
2. Imported topsoil.
3. Soil conditioners.
4. Fertilizer.
5. Seed mixes.
6. Erosion control matting.
7. Seeding mulch.
8. Tackifier.
9. Guarantee, maintenance and warranty.

1.2 RELATED SECTIONS

A. Section 31 05 13 - Soils for Earthwork

1.3 SUBMITTALS

A. The following submittals are required as part of this work:

1. Proof of procurement and contract for delivery of plant material.

2. Schedule for delivery of plant material for inspection prior to planting.

3. Sources of plant materials, and identification tags visible for each plant.

4. Color-coded tagging system for all plant material species. (Flag all plant materials prior to installation.)

B. Contractor’s Proposed Maintenance Plan.

PART 2 MATERIALS

2.1 TOPSOIL

A. Topsoil Type TS1, Select Native Topsoil Material, in accordance with Section 31 05 13, Soils for Earthwork.

2.2 IMPORTED TOPSOIL

A. Topsoil Type TS2, Imported Topsoil Material, in accordance with Section 31 05 13, Soils for Earthwork.

2.3 SOIL CONDITIONERS

A. Organic Material

1. Peat: A natural material formed by the decomposition of reeds, sedges, or mosses from freshwater sites. Peat shall be free from lumps, roots, or stones, and organic matter shall be not less than 90 percent on a dry weight basis.

2. Rotted Sawdust: Nitrogen stabilized, 1/4-inch minus, clean sawdust or shavings, free from weed seed, and containing no chemicals or materials harmful to plant life.

3. Manure: Well-rotted stable or cattle manure, reasonably free from weed seed and refuse, containing no chemicals or materials harmful to plant life. Manure shall be no less than 2 months or more than 1 year old. Sawdust and shavings shall not exceed 50 percent content of manure.

4. Mushroom Compost: Spent mushroom growing compost.

B. Sand

Clean, coarse, ungraded sand, meeting the requirements of ASTM C 33 for fine aggregate.

2.4 FERTILIZER

A. Slow Release Fertilizer:

1. Slow release fertilizer for use in erosion control seeding containing 22% nitrogen, 16% available phosphoric acid, and 8% potash, including a minimum of 2% sulfur.

2. The fertilizer shall contain not less than 30% available water-insoluble nitrogen derived by incorporating urea formaldehyde.

2.5 SEED MIX

A. Native Grasslands Seed Mix, as provided by Sunmark Seeds International, Inc., or approved equal.

1. See shall be certified, blue tag, clean, delivered in original, unopened packages bearing an analysis of the contents, guaranteed 95% pure and to have a minimum germination rate of 95% in one year.

2. The following seed mix shall be applied to areas disturbed by the Contractor along the alignment and north of the reservoir.

Seed Mix	Minimum Application Rate, lbs/acre
Blue wildrye (*Elymus glaucus*)	17.39
California brome (*Bromus carinatus*)	17.39
Native Red Fescue (*Festuca rubra rubra*)	6.52
Tufted Hairgrass (Deschampsia cespitosa)	2.17

2.6 EROSION CONTROL SEEDING MULCH

A. Wood or straw mulch processed so that the fibers are uniformly suspended under agitation in water.

B. Blend the mulch with seed, fertilizer, and other typical additives in a hydroseeding mixture to form a homogeneous slurry.

C. The processed mulch shall have the ability to hold grass seed in contact with soil.

D. Fibers shall have moisture-absorption and percolation properties to form a blotter-like cover on the ground.

E. Ship in packages of uniform weight (+/- 5%) and labeled with manufacturer's name and air-dry weight.

2.7 EROSION CONTROL MATTING

A. Jute Matting:

1. Jute matting shall consist of a uniform, open, plain weave of single jute yarn.

2. The yarn shall be of loosely-twisted construction and shall not vary in thickness by more than one-half of its normal diameter.

3. The weave shall provide openings of about 1 square inch.

4. Furnish the matting in widths of 45 inches or more, continuous lengths of not less than 150 feet, and weigh not less than 0.9 pounds per square yard.

B. Staples: 12 gauge or heavier steel wire which is bent to a U-shape 2 inches wide.

C. Excelsior Matting:

1. Consisting of a machine-produced blanket of curled wood fibers, of which 80% are 6-inches or longer.

2. Furnish a blanket of uniform thickness, with the fiber evenly distributed over the entire area of the mat.

3. Matting shall have a minimum dry weight of 0.8 pounds per square yard (+/- 10%). Furnish in a minimum 36-inch wide rolls.

2.8 TACKIFIER

A. Emulsion designed to retain moisture and heat in the soil.
B. Mulch shall be chemically inert, nontoxic to plants, humans, and animals.
C. Tackifier shall be J-Tac, Sentinnel Tackifier additive, or equal.

PART 3 EXECUTION

3.1 FINISH GRADING PROCEDURES

A. Mix topsoil with rough grade fill material and mix thoroughly to a depth of 8-inches with soil amendments in the following proportions:

Topsoil	6-inches
Sand	1-inch
Organic Material	1-inch

B. Finish Grading: Spread fill/topsoil material and rake the area to a uniform grade so that all areas drain, as indicated on the Drawings.

C. Preparation of Seedbed: Remove all trash and stones exceeding 2 inches prior to seeding.

3.2 TIME OF SEEDING

A. Conduct seeding operations under favorable weather conditions during seasons which are normal for such work generally from April 1 to June 1, and Sept. 1 to November 1.

B. Guarantee germination of erosion control seeding by November 1 at the latest.

C. Seed all native plant species in fall only.

3.3 EROSION CONTROL MATTING

A. Erosion control matting shall be placed on all slopes with a slope ratio of 2:1 and greater, or as directed by the Engineer.

B. Matting shall be laid flat in single thickness strips paralleling the direction of probable water flow.

C. Multiple strips of matting shall overlap in shingle fashion.

D. Adjacent strips of matting shall be overlapped a minimum of 1-foot, or as recommended by the manufacturer.

E. The erosion matting shall be in contact with the soil at all points and shall be held in place with wire staples, or as recommended by the manufacturer.

F. Anchor the matting in ditches at the top of the slope to ensure it will stay in place.

G. The installation and minimum spacing of wire staples shall be as per manufacturer's specifications.

3.4 SEEDING

A. All seeding shall be completed by hydroseeding. Add mulch and thoroughly mix with water prior to adding seed. Place the fertilizer in the hydroseeder tank no more than 30 minutes prior to application. Apply or spray the area thoroughly saturating the soil.

B. Seeding operations shall occur in two applications.

1. The first application shall include seed, fertilizer, and mulch.

2. The second application shall consist of tackifier and mulch only and be applied immediately after the first seeding. A second application of fertilizer shall be made two months after initial seeding at the rate indicated below.

C. Apply seed mixes per supplier’s recommendations.

3.5 INSPECTIONS

A. The work will be inspected for coverage and rate during placement.

END OF SECTION

SECTION 33 05 13

MANHOLES AND STRUCTURES

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes cast-in-place and precast concrete manholes and covers for access to subsurface utilities.

B. Section Includes:

1. Modular precast concrete manhole with tongue-and-groove joints with precast transition to cover frame, covers, anchorage, and accessories.

2. Bedding and cover materials.

1.2 RELATED SECTIONS

A. Section 31 05 13 - Soils for Earthwork
B. Section 31 05 16 - Aggregates for Earthwork
C. Section 31 23 16 – Excavation

1.3 REFERENCE STANDARDS

A. American Association of State Highway and Transportation Officials:

1. AASHTO M-198B – Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants.

B. American Concrete Institute:

1. ACI 301 – Building Code Requirements for Structural Concrete.
2. ACI 315 – Details and Detailing of Concrete Reinforcement.
3. ACI 318 – Building Code Requirements for Structural Concrete.

C. ASTM International:

1. ASTM A48 - Standard Specification for Gray Iron Castings.

2. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

3. ASTM A615 - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.

4. ASTM C55 - Standard Specification for Concrete Building Brick.

5. ASTM C62 - Standard Specification for Building Brick (Solid Masonry Units Made From Clay or Shale).

6. ASTM C150 - Specifications for Portland Cement.

7. ASTM C387 - Standard Specification for Packaged, Dry, Combined Materials for Concrete and High Strength Mortar.

8. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.

9. ASTM C478 - Standard Specification for Precast Reinforced Concrete Manhole Sections.

10. ASTM C497 - Standard Test Methods for Concrete Pipe, Manhole Sections, or Tile.

11. ASTM C827 – Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures.

12. ASTM C913 - Standard Specification for Precast Concrete Stormwater and Wastewater Structures.

13. ASTM C923 - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals.

14. ASTM C990 - Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants.

D. Federal Specifications:

1. SS-S-00210 (210-A) – Specification for Sealing Compound, Preformed Plastic, for Expansion Joints and Pipe Joints.

E. US Army Corp of Engineers:

1. CRD-C 621 – Specifications for Non-Shrink Grout.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data:

1. Pre-cast concrete manholes:

a. Design criteria and calculations.
b. Details of reinforcement.

2. Steps.

3. Cover and frame construction, features, configuration, dimensions and material specifications.

C. Shop Drawings:

1. Indicate manhole by location.

2. Provide dimensions, elevations, joints, location and type of lifting inserts.

3. Indicate connecting piping material, piping size, piping connection angles and offsets, and sizes of penetrations.

D. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.

E. Manufacturer Instructions: Submit detailed instructions on installation requirements, including storage and handling procedures.

F. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inspection: Accept materials on Site in manufacturer’s original packaging and inspect for damage.

B. Comply with precast concrete manufacturer's instructions and ASTM C913 for unloading, storing, and moving precast manholes and drainage structures.

C. Storage:

1. Store precast concrete manholes as to prevent damage to Owner's property or other public or private property.

2. Repair property damaged from materials storage.

PART 2 PRODUCTS

2.1 PERFORMANCE AND DESIGN CRITERIA FOR MANHOLES

A. Equivalent strength: Based on structural design of reinforced concrete as outlined in ACI 318.

B. Design of Lifting Devices for Precast Components: According to ASTM C913.

C. Design of Joints for Precast Components:

1. According to ASTM C913.
2. Lipped male/female joints.
3. Maximum Leakage: 0.025 gal. per hour per foot of joint at 3 feet of head.

D. Shaft Construction:

1. Reinforced concrete.
2. Concentric with concentric cone top section
3. Sleeved to receive pipe connections.

E. Wall Thickness:

1. Minimum wall thickness shall be 5 inches.
2. Cones shall have the same wall thickness and reinforcement as riser sections.

F. Shape: Cylindrical.

G. Clear Inside Dimensions:

1. As indicated on Drawings.
2. Sections shall consist of circular sections in standard nominal inside diameters of 42, 48, 54, 60, 72, 84, 96, 108, 120, 132, or 144 inches.

H. Design Depth:

1. As indicated on Drawings.

I. Clear Cover Opening: As indicated on Drawings, minimum of 30 inches.

J. Pipe Entry: Furnish openings as required and as indicated on the Drawings.

K. Steps:

1. Rungs:

a. Material: Formed polypropylene with 1/2-inch diameter, Grade 60 reinforcing bar.

b. Comply with ASTM C478.

c. Reinforcing bar to comply with ASTM A615.

2. Formed integral with manhole sections.

3. Width: Minimum 12 inches.

4. Spacing: 12 inches o.c. vertically.

2.2 MANHOLES

A. Precast Concrete Manholes:

1. Sections:

a. Description: Reinforced precast concrete according to ASTM C478.
b. Gaskets: According to ASTM C923.
c. Heights: Multiples of 6 inches.

2. Bases:

a. Base slab integral with sidewalls.
b. Monolithic construction, conforming to ASTM C478.

B. Cast-in-Place Concrete Manholes:

1. Sections: Reinforced cast-in-place concrete as specified in Section 03 30 00 - Cast-in-Place Concrete.

2. Concrete forming in accordance with Section 03 10 00, Concrete Work.

C. Joint Materials:

1. Mortar:

a. Conform to ASTM C387.

b. Admixtures

1) Allowable, not exceeding the following percentages of weight of cement:

a) Hydrated lime, 10 percent;
b) Diatomaceous earth or other inert materials, five (5) percent;

c. Consistency: Shall be such that it will readily adhere to the precast concrete if using the standard tongue and groove type joint.

d. Mortar not used within 30 minutes of initial mixing shall be discarded and not be used.

2. Non-Shrink Grout:

a. Description: Non-metallic, cementitious, commercial grout exhibiting zero shrinkage per ASTM C827 and CRD-C-621.

b. Manufacturers:

1) Preco-Patch;
2) Sika 212;
3) Euco N-S;
4) Five-Star;
5) Approved equal

3. Grout shall not be amended with water after initial mixing.

4. Grout not used within 20 minutes of initial mixing shall be discarded and not be used.

5. Commercial Concrete Bonding Agent:

a. Non-shrink grout shall be placed or packed only with the use of an approved commercial concrete bonding agent applied to all cured concrete surfaces being grouted.

b. Bonding agent shall be compatible with the brand of grout used.

c. Water shall not be used as a substitute for the commercial bonding agent.

D. Preformed mastic gaskets for manhole joints shall meet Federal Specifications SS-S-00210 (210-A), AASHTO M-198B and ASTM C990.

E. Reinforcement:

1. Formed steel wire.

2.3 FRAMES AND COVERS

A. Description:

1. Construction: ASTM A48, Class 30B cast iron.

2. Lid:

    a. Machined flat bearing surface.
    b. Removable.

3. Cover Design: Closed.

4. Live Load Rating: AASHTO H20 loading.

5. Cover: Molded with “S” cast in.

6. Coefficient of Friction on Outside Face: Minimum of 0.60.

2.4 RISER RINGS

A. Description:

1. 4 Inches to 6 Inches Thick:

    a. Material: Precast concrete.
    b. Comply with ASTM C478.

2. Less than 4 Inches Thick:

    a. Material: Cast iron.
    b. Comply with AASHTO M306.

3. Rubber Seal Wraps:

    a. Wraps and Band Widths: Conform to ASTM C877, Type III.
    b. Cone/Riser Ring Joint: Minimum 3 inches overlap.
    c. Frame/Riser Ring Joint: 2 inches overlap.
    d. Additional Bands: Overlap upper band by 2 inches.

2.5 MATERIALS

A. Bedding and Cover:

1. Bedding: Coarse Aggregate Material Type A1, as specified in Section 31 05 16, Aggregates for Earthwork. Aggregate size as shown in the Drawings.

2. Backfill Around Structure: Coarse Aggregate Material Type A1, as specified in Section 31 05 16, Aggregates for Earthwork. Aggregate size as shown in the Drawings.

3. Soil Backfill from Above Pipe to Finish Grade:

a. In existing or future roadways, right-of-way:

1) Coarse Aggregate Material Type A1, as specified in Section 31 05 16, Aggregates for Earthwork. Aggregate size as shown in the Drawings.

b. In non-paved areas outside of footprint of existing or future structures, outside of right-of-way:

1) Soil Type S1, as specified in Section 31 05 13, Soils for Earthwork.
2) Subsoil: No rocks over 6 inches in diameter, frozen earth, or foreign matter.

2.6 FINISHES

A. Steel:

1. Galvanizing:

a. ASTM A123.
b. Hot dip galvanize after fabrication.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify items provided by other Sections of Work are properly sized and located.

B. Verify built-in items are in proper location and ready for roughing into Work.

C. Verify correct size of manhole excavation.

3.2 PREPARATION

A. Design the method of placement for all precast items and add all reinforcing steel, embeds, bracing and other items necessary for placement. All portions of embeds which remain embedded in the concrete shall be made of stainless steel.

B. Mark each precast structure by indentation or waterproof paint showing date of manufacture, manufacturer, and identifying symbols and numbers as indicated on Drawings to indicate its intended use.

C. Coordinate placement of inlet and outlet pipe or duct sleeves required by other Sections.

D. Do not install manholes where site conditions induce loads exceeding structural capacity of manhole components.

E. Inspect precast concrete structures immediately prior to placement in excavation to verify structures are internally clean and free from damage; remove and replace damaged units.

F. Subgrade

1. Subgrade shall be compacted to 95 percent of maximum density.

2. Compacted subgrade shall be covered with a minimum of six (6) inches of aggregate base compacted to 95 percent of maximum density, extending a minimum of six (6) inches beyond the outside limits of the manhole, unless otherwise indicated on Drawings.

3. Grade the aggregate base to a uniform, level surface which will fully support the structure and to an elevation that will ensure proper positioning of the top slab or lid.

3.3 INSTALLATION

A. Excavation and Backfill:

1. Excavate manholes as specified in Section 31 23 16, Excavation in location and to indicated depth.

2. Provide 12 inches of clearance around sidewalls of structure for construction operations.

3. When groundwater is encountered, prevent accumulation of water in excavations; place manholes in dry trench.

B. Where possibility exists of watertight structure becoming buoyant in flooded excavation, anchor structure to avoid flotation as approved by Engineer.

C. Base Pad:

1. Place base pad.
2. Trowel top surface level.

D. Backfill excavations for manholes as specified in Section 31 23 23, Fill.

E. Form and place manhole cylinder plumb and level and to correct dimensions and elevations.

F. Grout base of shaft sections to achieve slope to exit piping, trowel smooth, and contour to form continuous drainage channel.

G. Set cover frames and covers level without tipping and to correct elevations.

H. Coordinate with other Sections of Work to provide correct size, shape, and location.

I. Precast Concrete Manholes:

1. Assembly:

a. Install precast structures in accordance with the manufacturer's recommendations unless otherwise required by the Contract Documents.

b. Verify installed manholes meet required alignment and grade.

c. Lift precast components at lifting points designated by manufacturer.

d. When lowering manholes into excavations and joining pipe to units, take precautions to ensure that interior of pipeline and structure remains clean.

e. Set precast structures bearing firmly and fully on crushed stone bedding, compacted as specified in Section 31 23 23, Fill or on other support system as indicated on Drawings.

f. Assemble multi-section structures by lowering each section into excavation; set level and firmly position base section before placing additional sections.

g. Place manhole sections plumb and level, trim to correct elevations, and anchor to base pad.

h. Remove foreign materials from joint surfaces and verify sealing materials are placed properly.

i. Maintain alignment between sections by using guide devices affixed to lower section.

2. Joints:

a. Sealing materials may be installed onsite or at manufacturers plant.

b. All joints shall be sealed watertight by the use of rubber gaskets or other approved preformed sealant.

c. All joints shall then be filled with non-shrink grout on both the inside and outside surfaces to produce smooth interior and exterior surfaces.

3. Concrete Base Installation:

a. Bases shall be set at the proper grade to allow pipe openings to match the grades for connecting pipes.

b. Invert shall be constructed to a section identical with that of the sewer pipe.

c. Where the size of sewer pipe is changed at the manhole, the invert shall be constructed to form a smooth transition without abrupt breaks or unevenness of the invert surfaces.

d. Prevent sewage or water from contacting the new concrete or mortar surfaces to prevent damage to the fresh concrete or mortar until the initial set has been achieved.

e. Manhole bases shall be set level so base gravel fully and uniformly supports them in true alignment with uniform bearing throughout full circumference.

f. Do not level the base sections by wedging gravel, or other material, under the edges.

g. Flexible connectors shall be installed in the base section to form a permanently watertight seal.

4. Manhole Riser Sections:

a. Precast manhole components may be used to construct standard, drop and carry-through manholes. Manholes less than four (4) feet in depth measured from the spring line of the pipe to the bottom of the lower riser ring shall be flat-top manholes.

b. Install manhole riser sections at the location shown on the plans. All sanitary sewer and pollution control manholes joints shall be watertight and shall use rubber gaskets or a preformed sealant. All joints shall then be filled with non-shrink grout inside and out so as to produce smooth interior and exterior surfaces. All manhole penetrations shall be watertight. Complete manholes shall be rigid. Compact backfill in accordance with the provisions stated elsewhere in this document.

c. All lift holes shall be thoroughly wetted, completely filled with mortar, and smoothed and pointed both inside and out to ensure watertightness.

d. The shortest length of riser section to be incorporated into the manhole shall be installed immediately below the flat slab top or cone.

e. Properly locate and plumb each manhole riser section.

f. Install manhole extensions and top slabs in accordance with manufacturer's specifications and as shown on the plans. Lay section risers with the sides plumb and the tops level. Make joints and penetrations watertight.

g. Remove knockouts or cut structure to receive piping without creating openings larger than required to receive pipe; fill annular spaces with mortar.

5. Entrances / Exits:

a. Cut pipe flush with interior of structure.

b. Shape inverts through manhole as indicated on Drawings.

c. All rigid non-reinforced pipe entering or leaving the manhole (new or existing manhole) shall be provided with flexible joints within one (1) foot of the structure and shall be placed on compacted bedding.

d. Ribbed HDPE pipe connections shall be grouted watertight with non-shrink grout.

e. PVC pipe shall be connected to manholes using an approved adapter specifically manufactured for the intended service.

1) Adapters shall be Fernco, Kor-N-Seal, or approved equal.

6. Grates, Frames, and Covers:

a. Manhole frames, grates and covers shall be installed in such a manner as to prevent infiltration of surface or groundwater between the frame and the concrete of the manhole section. Use preformed rubber ring to form a watertight seal.

b. Manhole frames and covers shall be installed to grades shown on the drawings or as directed.

c. Adjustment of manhole castings shall be made using specified precast grade rings and approved rubber ring joints.

d. The maximum depth of adjustment below any manhole casting shall be 16 inches, and a minimum depth of adjustment shall be four (4) inches.

3.4 FIELD QUALITY CONTROL

A. Test concrete manhole and structure sections according to ASTM C497.

B. Perform manhole testing according to Section 33 01 30.13, Sewer and Manhole Testing.

C. Test cast-in-place concrete as specified in Section 03 11 00, Concrete Work.

D. Vertical Adjustment of Existing Manholes:

1. If required, adjust top elevation of existing manholes to finished grades as indicated on Drawings.

2. Reset existing frames, grates, and covers that were carefully removed and cleaned of mortar fragments to required elevation according to requirements specified for installation of castings.

3. When removal of existing concrete wall is required, remove concrete without damaging existing vertical reinforcing bars, clean concrete from vertical bars, and bend into new concrete top slab or splice to required vertical reinforcement as indicated on Drawings.

4. Clean and apply sand-cement bonding compound on existing concrete surfaces to receive cast-in-place concrete as specified in Section 03 11 00, Concrete Work.

END OF SECTION

SECTION 33 11 10

WATER UTILITY DISTRIBUTION & TRANSMISSION PIPING

PART 1 GENERAL

1.1 SUMMARY

A. Work under this Section applies to furnishing and installation of pipe materials, fittings and appurtenances normally encountered with water distribution and transmission systems, including potable water and fire water systems.

B. Section includes:

1. Pipe and fittings.
2. Flexible couplings.
3. Flanged coupling adapters.
4. Insulating flanged joints.
5. Tapping sleeves and valves.
6. Flexible expansion joints.
7. Bedding and cover materials.

C. Related Requirements:

1. General

a. Furnish and install all piping systems shown and specified in accordance with the requirements of the Contract Documents.

b. Each buried piping system shall be complete, with all necessary fittings, valves, accessories, lining and coating, testing, excavation, backfill and encasement, to provide a functional installation.

c. Piping layouts shown in the Drawings are intended to define the general layout, configuration, and routing for pipe, as well as the size and type of piping to be installed. The piping plans are not pipe construction or fabrication drawings.

d. The Contractor shall cause the Supplier of pipes, valves, fittings and appurtenances to coordinate piping installation such that all equipment is

compatible and is capable of achieving the performance requirements specified in the Contract Documents.

e. It is the Contractor's responsibility to develop the details necessary to construct all piping systems, to accommodate the specific equipment provided, and to provide and install all spools, spacers, adapters, connectors, valves, gaskets, fittings, appurtenances etc., for a complete and functional system.

1.2 RELATED SECTIONS

A. Section 03 11 00 - Concrete Work
B. Section 31 05 13 - Soils for Earthwork
C. Section 31 05 16 - Aggregates for Earthwork
D. Section 31 23 16 - Excavation
E. Section 31 23 17 - Trenching
F. Section 33 12 16 - Water Utility Distribution & Transmission Valves
G. Section 33 13 00 - Testing & Disinfecting of Water Utility Piping

1.3 REFERENCE STANDARDS

A. American Association of State Highway and Transportation Officials:

1. AASHTO T99 - Standard Specification for Moisture-Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in.) Drop.

B. American Society of Mechanical Engineers:

1. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.

2. ASME B16.5 - Pipe Flanges and Flanged Fittings, Steel Nickel Alloy and other Special Alloys.

3. ASME B16.21 - Nonmetallic Flat Gaskets for Pipe Flanges.

4. ASME B31.10 - Standards of Pressure Piping.

C. ASTM International:

1. ASTM A36 - Standard Specification for Carbon Structural Steel.

2. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

3. ASTM A193 - Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications

4. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.

5. ASTM A536, Standard Specification for Ductile Iron Castings.

6. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).

7. ASTM D1598 - Standard Test Method for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure.

8. ASTM D1784 - Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.

9. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.

10. ASTM D2241 - Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).

11. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.

12. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

13. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

D. American Water Works Association:

1. AWWA C104 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings.

2. AWWA C105 - Polyethylene Encasement for Ductile-Iron Pipe Systems.

3. AWWA C110 - Ductile-Iron and Gray-Iron Fittings.

4. AWWA C111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

5. AWWA C115 - Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.

6. AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast.

7. AWWA C153 - Ductile-Iron Compact Fittings.

8. AWWA C219 - Bolted, Sleeve-Type Couplings for Plain-End Pipe

9. AWWA C600 - Installation of Ductile-Iron Mains and Their Appurtenances.

10. AWWA C605 - Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water.

11. AWWA C606 - Grooved and Shouldered Joints.

12. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Transmission and Distribution.

13. AWWA C905 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 In. Through 48 In. (350 mm Through 1,200 mm) for Water Transmission and Distribution.

E. Manufacturers Standardization Society of the Valve and Fittings Industry:

1. MSS SP-60 - Connecting Flange Joints between Tapping Sleeves and Tapping Valves.

F. National Sanitation Foundation:

1. NSF Standard 61 - Drinking Water System Components – Health Effects.

2. NSF Standard 372 - Drinking Water System Components – Lead Content.

G. SUBMITTALS

H. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

I. Product Data: Submit data on pipe materials, pipe fittings, restrained joint systems, and accessories.

J. Shop Drawings: Indicate piping layout, including piping specialties.

1. Layout Schedule for applicable segments of proposed transmission main alignment. Schedule shall include layout plan and dimensions, schedule of pipe fittings and specials, materials and class for each size and type of pipe, joint details, pipe supports, and any special provisions required for assembly.

K. Lining and coating data.

L. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

M. Manufacturer’s handling, delivery, storage and installation requirements.

N. Field Quality-Control Submittals:

1. Pipeline hydrostatic testing plan.

2. Indicate results of Contractor-furnished tests and inspections.

O. Preconstruction Photographs:

1. Submit digital files of colored photographs of Work areas and material storage areas.

1.4 CLOSEOUT SUBMITTALS

A. As-Built Drawings:

1. Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations.

2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.5 QUALITY ASSURANCE

A. Materials:

1. Unless otherwise noted, all water works materials provided for the project shall be new, of first-class quality and shall be made by reputable manufacturers.

2. All material of a like kind shall be provided from a single manufacturer unless otherwise approved by the Owner’s Representative.

3. All material shall be carefully handled and installed in good working order free from defect in manufacture, storage and handling.

4. All fittings shall be manufactured in the United States of America, unless otherwise approved by the Owner.

B. Markings:

1. Pipes and Fittings: Mark each pipe and fitting at plant. Include date of manufacture, manufacturer’s identification, specification standard, inside diameter of pipe, dimension ratio as applicable, pipe class as applicable, pipe

number for laying purposes as applicable, and other information required for type of pipe.

2. Bolting materials (washers, nuts and bolts) shall be marked with material type.

C. Testing:

1. Except where otherwise specified, all materials used in the manufacture of the pipe shall be tested in accordance with the applicable Specifications and Standards.

1.6 MATERIAL DELIVERY, STORAGE, AND HANDLING

A. In accordance with manufacturer's written recommendations and as specified in these Contract Documents.

B. Pipe, specials, and fittings delivered to Project Site in damaged condition will not be accepted.

C. Storage:

1. Store and support pipe securely to prevent accidental rolling and to avoid contact with mud, water, or other deleterious materials.

2. Pipe and fittings shall not be stored on rocks, gravel or other hard material that might damage pipe. This includes storage area and along pipe trench.

3. Do not store materials in direct sunlight.

4. Gaskets: Do not allow contact with oils, fuels, petroleum, or solvents.

D. Handling:

1. Pipe and appurtenances shall be handled in accordance with manufacturer's recommendations or requirements contained in this section or subsequent sections dealing with the specific pipe material, whichever is more stringent.

2. Pipe shall be handled with proper equipment in a manner to prevent distortion or damage. Use of hooks, chains, wire ropes, or clamps that could damage pipe, damage coating or lining, or kink and bend pipe ends is not permitted.

3. Use heavy canvas, or nylon slings of suitable strength for lifting and supporting materials.

4. Lifting pipe during unloading or lifting into trench shall be done using two slings placed at quarter point of pipe section. Pipe may be lifted using one sling near center of pipe, provided pipe is guided to prevent uncontrolled swinging and no

damage will result to pipe or harm to workers. Slings shall bear uniformly against pipe.

PART 2 PRODUCTS

2.1 WATER PIPING

A. General

1. All piping materials and specials shall meet the specifications of this Section and of the appropriate AWWA Standard Specifications. In the case of conflict, the more stringent specifications shall apply.

2. All coatings and materials specified herein which may come in contact with potable water shall conform to National Sanitation Foundation (NSF) Standard 61 and 372.

3. Minimum Pressure Ratings: Unless otherwise specified herein or shown in the Drawings, the minimum working pressure rating of all water works materials specified herein shall be 1.5 times the operating pressure or 150 psi minimum.

4. Gaskets:

   a. Material: Styrene Butadiene Rubber (SBR) composition.

B. Ductile Iron Pipe:

1. Centrifugally cast, conforming to AWWA Standard C151.

2. Coating: Asphaltic exterior coating in accordance with AWWA Standard C151.

3. Pipe Mortar Lining: Shop-applied NSF 61 cement mortar lining, smoothed finish, complying with AWWA C104.

4. Pipe Thickness Class:

   a. Comply with AWWA C151.

   b. Class 52, unless shown to be greater in the Plans.

      1) The Contractor shall be aware ductile iron piping with thickness class greater than Class 52 may have long fabrication and supplier lead times. The Contractor shall be responsible for coordinating product submittal and delivery times accordingly such as not to delay construction.

5. Gauged Pipe:

a. All ductile iron pipe 24-inch diameter or greater to be cut in the field shall be gauged full length and, along the full length, shall meet the outside diameter standard dimensions and tolerances required for spigot ends along the full length of pipe to within 2 feet of the bell end.

b. In addition to pipe supplied for anticipated cutting, a minimum of 5% of each size of piping 24-inch diameter or greater shall be provided gauged full length as described above.

c. Pipe shall be externally marked, in manufacturer's color, indicating gauged pipe.

6. Polyethylene Encasement:

a. Comply with AWWA C105.

b. Polyethylene film shall be minimum 8-mil thick virgin linear low-density polyethylene (LLDPE).

7. Joints:

a. Joint types shall be provided as identified in the Drawings and as required for the application.

b. Mechanical Joints:

1) Comply with AWWA C111.

c. Push-on Joints:

1) Comply with AWWA C111.

2) Manufacturers, without exception:

a) Tyton Joint by American Cast Iron Pipe Company, U.S. Pipe and Foundry Company, McWane, and Pacific States Cast Iron Pipe.

b) Fastite Joint by American Cast Iron Pipe Company.

d. Restrained Joints:

1) Joint restraint for pipe shall be accomplished with an integral lock mechanism, except as may be otherwise specified. Any such system shall be a manufacturer's standard proprietary design, shall be as recommended by the manufacturer for the application, and shall be performance proven.

2) Restraining components:

a) Ductile iron complying with AWWA C110 and/or C153, with the exception of a manufacturer's proprietary design dimensions.

b) Push-on joints for such fittings shall comply with AWWA C111.

3) Deflection:

a) The maximum pipe deflection shall not exceed one half of the manufacturer's stated joint deflection allowance.

4) Manufacturers:

a) "TR Flex", United States Pipe and Foundry Company.

b) "Flex-Ring", American Cast Iron Pipe Company

c) "MEGALUG", EBAA Iron, Inc.

(1) Where any restrained joint system requires the use of a wedge-type mechanical restraint gland for restraint, the glands shall be provided in quantities as may be required and shall be considered incidental to the joint restraint system.

(2) Wedge-type mechanical restraining glands shall not be used to restrain the plain end of plain end ductile iron or cast iron fittings.

e. Flanged Joints:

1) Flat faced, complying with AWWA C111 and C115, unless otherwise specified.

2) Bolt hole drilling according to ASME/ANSI B16.1, Class 125, or ASME/ANSI B16.1, Class 250, where specified. Flanges shall be attached with bolt holes straddling the vertical axis of the pipe unless otherwise shown.

3) The Contractor shall coordinate with pipe, valve and fitting suppliers to make certain mating pipe, valve and fitting flanges match in bolt pattern.

4) Pressure rating of flange joints shall not exceed the rating of the pipe or fitting of which they are a part and the maximum pressure rating of the joint shall be 250 psi.

5) Flange joint connections shall not be exposed to test pressures greater than 1.5 times their rated working pressure.

6) Threaded flanges:

a) Ductile iron pipe spools with threaded flanges shall conform to AWWA C115.

b) Installed only on pipe with a minimum Class 53 wall thickness.

7) Buried flanges:

a) Flanged connections shall not be buried unless shown as such on the Drawings.

b) Buried flanges shall be wrapped with wax tape as specified herein..

8) Gaskets:

a) Full faced, composed of synthetic rubber and 1/8-inch thick conforming to ASME B21.1 and AWWA C111.

b) Ring gaskets will be permitted only where specifically noted in the Drawings and Specifications.

c) Gaskets for flanged joints shall be as follows:

(1) Pipe sizes between 6-inch and 24-inch diameter, service pressures of 150 psi or greater shall be Garlock 3760-U or equal.

(2) Pipe sizes 4-inch diameter and under, service pressures of 150 psi or greater shall be Garlock 3505 or equal.

(3) All pipe sizes with service pressures of 150 psi or less shall be Garlock 98206 or equal.

d) Insulating flanged joints:

(1) Full faced, conform to ANSI 16.21.

(2) Material: Non-asbestos.

(3) Suitable for operating and test pressures of the pipe system.

(4) Manufacturer:

(a) Garlock GYLON Style 3505 or equal.

(5) See Specification Section 26 42 01 – *Corrosion Monitoring System for Ductile Iron Pipe* for additional requirements for insulated flange joints.

2.2 FITTINGS:

A. Material: Ductile iron, complying with AWWA Standard C110.

1. Fittings conforming to AWWA C153 may be substituted in lieu of AWWA C110 fittings.

B. Fittings used for joining ductile iron and PVC pipe shall be of the type, size and strength designated on the Plans, elsewhere in the specifications.

1. Fittings shall be mechanical joint, push-on type, flanged or plain-end as required and shown on the Drawings.

2. All restraint systems and flanged fittings shall be provided with bolts and gaskets as specified herein.

C. Pressure ratings: As specified for joining pipe above and as shown on the Drawings.

D. Coating and Lining:

1. Asphaltic exterior coating in accordance with AWWA Standard C110.

2. Cement Mortar Lining: Comply with AWWA C104.

3. Wax Tape Coating System (Field Coating): Petrolatum wax tape coating system:

a. General: Apply a wax tape coating system generally per AWWA C217 and consists of three parts: surface primer, wax-tape, and outer covering. All three parts shall be the product of the same manufacturer.

b. The primer shall be a blend of petrolatum, plasticizer, and corrosion inhibitors having a paste like consistency. It shall have a pour point of 100-degrees F to 110-degrees F and a flash point of 350-degrees. Use Trenton Wax-Tape Primer or approved equal.

c. The wax-tape shall consist of a synthetic-fiber felt, saturated with a blend of high melt microcrystalline wax, solvents, and corrosion inhibitors, forming a tape coating that is easily formable over irregular surfaces and which firms up after application. The tape shall have a saturant pour point between 125-degrees F and 130-degrees F and a dielectric strength equal to a minimum of 100-volts per mil. Tape thickness shall be 50-mils to 90-mils in 6-inch wide rolls. Use Trenton No. 1 wax-tape or approved equal.

d. The outer covering shall consist of two layers of a plastic wrapper at total of one 150 gauge or three 50 gauge wound together as a single sheet.. The plastic wrapper material shall consist of clear polyvinylidene chloride, high cling

membranes wound together as a single sheet. Use Trenton Poly-Ply or approved equal.

E. Following information cast upon fittings:

1. Manufacturer's identification.

2. Country of manufacture.

3. Pressure rating.

4. For bends, number of degrees and/or fractions of a circle.

F. Owner may require additional metallurgical documentation or other certifications.

2.3 NUTS, BOLTS AND WASHERS:

A. All bolts shall have heavy hex head with heavy hex nuts.

B. For operating pressures greater than 150 psi:

1. Bolts: Steel alloy composition. Comply with ASTM A193.

2. Nuts: Comply with ASTM A194, Grade 2H.

3. Washers: Comply with ASTM F436.

C. For operation pressures of 150 psi or less:

1. Bolts: Low-carbon steel composition. Comply with ASTM A307, Grade B.

2. Nuts: Comply with ASTM A563A, Heavy Hex.

3. Washers: Comply with ASTM F844.

D. Higher-strength bolts with higher torque values as specified above for operation pressures greater than 150 psi shall not be used for assembly of flange joints including gray-iron flanges.

2.4 FLEXIBLE COUPLINGS

A. General

1. All flexible couplings shall be constructed to inside diameters that properly fit the connecting pipes.

2. The Contractor shall be responsible for selecting sleeve lengths appropriate to the application, subject to review and approval of the Engineer, recognizing that longer sleeves allow for larger deflections and may ease installation.

B. Flexible Couplings:

1. Description:

a. Comply with AWWA C219.

b. Type: Bolted, sleeved.

c. Configuration: Straight, transition or reducing as shown in the Drawings.

d. Center rings and end rings: Ductile iron. Comply with ASTM A536.

e. Gaskets: Virgin styrene butadiene rubber (SBR) compounded for water service. Comply with ASTM D2000.

f. Bolts and nuts: High strength low alloy steel. Comply with AWWA C111.

g. Lining and coating: Factory-applied fusion bonded epoxy.

h. Working pressure: Up to 260 psi.

2. Manufacturers:

a. For 2-inch to 12-inch diameter:

1) Romac Industries, Inc. – Style 501 or equal.

b. For 14-inch diameter and larger:

1) Romac Industries, Inc. – 400 Series or equal.

C. Insulating Flexible Couplings:

1. The Contractor shall be responsible for selecting couplings appropriate to the application, subject to review and approval of the Engineer, recognizing that different pipe materials will require specific sizing and material selection for couplings.

2. Description:

a. Comply with Flexible Coupling specifications above.

b. Insulating Boot: Ethylene propylene diene monomer (EPDM) compounded for water service. Comply with ASTM D2000.

3. Manufacturers:

a. For 4-inch to 14-inch diameter:

1) Romac Industries, Inc. – Style IC501 or equal.

b. For 12-inch to 96-inch diameter:

1) Romac Industries, Inc. – Style IC400 or equal.

D. Restrained Flexible Couplings:

1. Description:

a. Body: Steel. Comply with ASTM A36.

b. Restrained gland: Ductile iron. Comply with ASTM A536, Grade 65-45-12.

c. Gaskets: Virgin styrene butadiene rubber (SBR) compounded for water service. Comply with ASTM D2000.

d. Bolts and nuts: All-thread rod, at a minimum complying with ASTM A193 Grade B7. Nuts per ASTM A194 Grade 2H.

e. Lining and coating: Factory-applied fusion bonded epoxy.

f. Working pressure: 250 psi. Test pressure: 400 psi.

2. Manufacturers:

a. Romac Industries, Inc. – Style 400RG

b. EBAA Iron – 3800 MEGA-COUPLING

2.5 FLANGED COUPLING ADAPTERS

A. Flanged Coupling Adapters:

1. All flanged coupling adapters shall be constructed to diameters that properly fit the connecting plain end pipe and the flanged fitting.

2. Description:

a. Comply with AWWA C219.

b. Flange: AWWA Class D Steel Ring Flange, compatible with ANSI Class 125 & 150 bolt circles.

c. End ring and body:

1) Steel. Comply with ASTM A36.

2) Ductile iron. Comply with ASTM A536, Grade 65-45-12.

d. Flange: Compatible with ANSI Class 125 & 150 bolt circles.

e. Gaskets: Virgin styrene butadiene rubber (SBR) compounded for water service. Comply with ASTM D2000.

f. Bolts and nuts: High strength low alloy steel bolts and nuts. Comply with AWWA C111 composition requirements.

g. Lining and coating: Factory-applied fusion bonded epoxy.

h. Working pressure rating: Equal to the maximum rating of the flange.

3. Manufacturers:

a. Romac Industries, Inc.

1) Style FCA501

a) For 3-inch to 16-inch diameter.

2) Style FC400.

a) For 12-inch to 96-inch diameter.

B. Restrained Flanged Coupling Adapters:

1. Description:

a. Gland and flange body: Ductile iron. Comply with ASTM A536.

b. Flange: Compatible with ANSI Class 125 & 150 bolt circles.

c. Gaskets: Virgin styrene butadiene rubber (SBR) compounded for water service. Comply with ASTM D2000.

d. Restraining bolts and lugs: Ductile iron. Comply with ASTM A536.

e. T-bolts Bolts and nuts: High strength low alloy steel. Comply with AWWA C111 composition requirements.

f. Lining and coating: Factory-applied fusion bonded epoxy.

2. Manufacturers:

a. Romac Industries, Inc. – RFCA Restrained Flanged Coupling Adapters.

b. EBAA Iron – MEGAFLANGE Restrained Flange Adapter.

2.6 TAPPING SLEEVES AND VALVES

A. Tapping Sleeves:

1. Description:

a. Type: Dual compression.

b. Material:

1) Body: Stainless steel, Type 304.

2) Flanged outlet: Stainless steel, Type 304.

c. Outlet Flange Dimensions and Drilling: Comply with ASME B16.1, Class 150 and MSS SP-60.

d. Outlet Gasket:

e. Provide with Type 304 stainless steel test plug.

f. Nuts, bolts and washers: Stainless steel, Type 304.

2. Manufacturers:

a. Romac Industries, Inc. – Model STS 420

b. JMC Industries, Inc.

B. Tapping Valves:

1. Resilient wedge gate valves specified in Section 40 05 23.15, Gate Valves.

2.7 FLEXIBLE EXPANSION JOINTS

A. Description

1. Installed at locations indicated in the Drawings.

2. End connections: As shown in the Drawings.

3. Material: Ductile iron, AWWA C153.

4. Working pressure: 350 psi, minimum.

5. Construction:

    a. An expansion joint designed and cast as an integral part of a double ball and socket type flexible joint.

    b. Manufactured of ductile iron, conforming to requirements of AWWA C153 and ASTM A536.

    c. Deflection: Minimum of 15 degrees deflection per ball.

    d. Expansion:

        1) 12-inch diameter and under: 8 inch.

        2) Greater than 12-inch diameter: 16 inches.

    e. Each flexible expansion joint shall be hydrostatically tested to the manufacturer's published pressure rating prior to shipment.

    f. Lining: All interior "wetted" parts shall be shop-lined with a minimum of 15 mils of fusion bonded epoxy conforming to the applicable requirements of AWWA C213 and shall be holiday tested with a 1500-volt spark test conforming to said specification.

    g. Coating: Coal tar epoxy.

6. Quality Assurance: Hydrostatically tested to manufacturer's published pressure rating prior to shipment.

7. Appropriately sized polyethylene sleeves, meeting AWWA C105 requirements, shall be included for direct bury applications.

B. Manufacturers

1. EBAA Iron, Inc. – Flex-Tend or equal.

2.8 UNDERGROUND PIPE MARKERS

A. As specified in Section 31 23 17, Trenching.

2.9 CONCRETE ENCASEMENT AND CRADLES

A. Concrete:

1. As specified in Section 03 11 00 - Concrete Work.

2. Type: reinforced, air entrained as shown in the Drawings.

3. Compressive Strength: Minimum 3,000 psi at 28 days.

4. Finish: Rough troweled.

B. Concrete Reinforcement: As specified in Section 03 11 00 – Concrete Work.

2.10 MATERIALS

A. Bedding and Cover:

1. Pipe Bedding: Coarse Aggregate Material Type A1, as specified in Section 31 05 16, Aggregates for Earthwork. Aggregate size as shown in the Drawings.

2. Pipe Zone Backfill: Coarse Aggregate Material Type A1, as specified in Section 31 05 16, Aggregates for Earthwork. Aggregate size as shown in the Drawings.

3. Trench Backfill from Pipe Zone to Finish Grade:

a. Material type varies by location, as shown in the Drawings.

b. Coarse Aggregate Material Type A1, as specified in Section 31 05 16, Aggregates for Earthwork. Aggregate size as shown in the Drawings.

c. Subsoil Type S1or S2, as specified in Section 31 05 13, Soils for Earthwork.

2.11 ACCESSORIES

A. Concrete for Thrust Restraints: As specified in Section 03 11 00 – Concrete Work.

B. Manhole and Cover: As specified in Section 33 05 13 - Manholes and Structures.

C. Miscellaneous Steel Rods, Bolt, Lugs, and Brackets:

1. Comply with ASTM A36 or ASTM A307.

2. Grade A carbon steel.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that existing utility water main size, location, and invert are as indicated on Drawings.

3.2 PREPARATION

A. Preconstruction Site Photos:

1. Take photographs along centerline of proposed pipe trench; minimum one photograph for each 50 feet of pipe trench.

2. Show mailboxes, curbing, lawns, driveways, signs, culverts, and other existing Site features.

3. Include Project name, date taken, and sequential number of each photograph in physical log or CD.

B. Inspection:

1. All pipe sections, specials and jointing materials shall be carefully examined for defects.

2. No piping or related materials shall be laid that is known to be defective. Any defective piece installed shall be removed and replaced with a new pipe section in a manner satisfactory to the Engineer at the Contractor's expense.

3. Defective material shall be marked and removed from the job site before the end of the day.

C. Pipe Cutting:

1. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, and remove burrs.

2. Use only equipment specifically designed for pipe cutting; use of chisels or hand saws is not permitted.

3. Grind edges smooth with beveled end for push-on connections.

4. Prior to assembly of field cut pipe, the reference mark shall be re-established with a pencil or crayon. The location of the reference mark at the proper distance from the bevel end shall be in accordance with the manufacturer's recommendations.

D. Remove scale and dirt on inside and outside before assembly. Cleaning of each pipe or fitting shall be accomplished by swabbing out, brushing out, blowing out with compressed air, or washing to remove all foreign matter.

E. Prepare pipe connections to equipment with flanges or unions.

3.3 INSTALLATION

A. Bedding:

1. Excavation:

a. Excavate pipe trench as specified in Section 31 23 17, Trenching for Work of this Section.

b. All pipe trenches shall be excavated below the proposed pipe invert as required to accommodate the depths of pipe bedding material as scheduled on the Drawings.

c. Remove large stones or other hard matter which could damage pipe or impede consistent pipe bedding backfilling or compaction.

d. Trench base shall be inspected prior to placement of pipe.

e. Hand trim excavation for accurate placement of pipe to elevations as indicated on Drawings.

2. Dewater excavation as specified in Section 31 23 19, Dewatering to maintain dry conditions and to preserve final grades at bottom of excavation.

3. Provide sheeting and shoring as specified in Section 31 23 17, Trenching.

4. Place bedding material at trench bottom, level fill materials in one continuous layer not exceeding 6 inches compacted depth, and compact to 95 percent of maximum density.

B. Piping:

1. Install pipe according to AWWA C600.

2. Handle and assemble pipe according to manufacturer instructions and as indicated on Drawings.

3. Lift or roll pipe into position. Do not drop or drag pipe over prepared bedding.

4. Steel Rods, Bolt, Lugs, and Brackets: Coat buried steel with one coat of coal tar coating before backfilling.

5. Sanitary Sewer Separation:

a. Install new water lines and appurtenances in compliance with local and state regulations governing the horizontal and vertical separations between water and sewer facilities.

b. Variance:

1) If a variance is proposed due to requested design revisions or if an existing facility has been installed at a different location or elevation than indicated on the Plans, submit written proposal for review and approval by the Engineer.

2) Include the reason for the variance, type of material and condition of the sewer line, location of the water and sewer facilities, horizontal and vertical skin-to-skin clearances and corrective measures proposed.

3) Each variance will be considered on a case-by-case basis.

4) Review Time: Allow a minimum of 5 working days review and response to each proposal.

6. Install ductile iron fittings according to AWWA C600.

7. Joints:

a. Pipe jointing surfaces shall be clean and dry when preparing surfaces for joining.

b. Lubricants, primers, adhesives, etc. shall be used as recommended by the pipe or joint manufacturer's specifications.

c. The jointing materials or factory-fabricated joints shall then be placed, fitted, joined, and adjusted in such a manner as to obtain a watertight joint.

d. Trenches shall be kept water-free and as dry as possible during bedding, laying and jointing.

e. As soon as possible after the joint is made, sufficient backfill material shall be placed along each side of the pipe to prevent movement of the pipe from any cause.

8. Flanged Joints: Not to be used in underground installations except within structures, unless shown otherwise in the Drawings.

9. Deflection:

a. The maximum pipe deflection shall not exceed one-half of the manufacturer's stated joint deflection allowance.

b. Set a laser, string line or other approved alignment guide along the centerline of previously installed pipe to the point where pipe joint deflection is

required. The approved alignment guide shall extend to the end of the proposed subsequent pipe length. A measurement will be taken from the alignment guide to the centerline of the subsequent pipe length to determine the amount of pipe joint deflection proposed. Measured deflection shall not exceed the specified allowable deflection for the purposes of aligning the pipe.

10. Install pipe and fittings to the line and grade specified on the Drawings, with joints centered, pipe properly supported and restrained against movement, and all valve stems plumb. Re-lay pipe that is out of alignment or grade.

11. High Points:

    a. Install pipe with no high points, unless otherwise shown in the Drawings.

    b. If unforeseen field conditions arise that necessitate high points, install air release valves as directed by Engineer.

12. Bearing:

    a. Install pipe to have bearing along entire length of pipe.

    b. Excavate bell holes to permit proper joint installation where necessary or as directed by Engineer.

    c. Do not lay pipe in wet or frozen trench.

13. Prevent foreign material from entering pipe during placement.

14. Install pipe to allow for expansion and contraction without stressing pipe or joints.

15. Close pipe openings with watertight plugs during Work stoppages.

16. All pipe ends which are to be permanently closed shall be plugged or capped and restrained against internal pressure.

17. Install access fittings to permit disinfection of water system performed under Section 33 13 00 – Testing and Disinfecting of Water Utility Piping.

18. Cover:

    a. Establish elevations of buried transmission main piping with not less than 60 inches of cover and as shown on the Plans.

    b. Measure depth of cover from final surface grade to top of pipe barrel.

19. Pipe Markers:

a. Install as specified in Section 31 23 17, Trenching.

C. Tapping Sleeves and Valves:

1. As indicated on Drawings and according to manufacturer instructions.

D. Wax tape Coating for DI Fittings, Valves and Appurtenances:

1. Coat all buried DI fittings and valves, mechanical joints and restraints, and pipe flanges with wax tape coating system in accordance with AWWA C217 and in accordance with manufacturer's recommendations. Extend the wax tape coating system over the adjacent ductile iron piping past the fitting, restraint, flange, etc. by a minimum 6-inches.

2. The surfaces to receive the wax tape coating shall be clean and free of all dirt, grease, and other foreign material. Apply primer as recommended by tape manufacturer or cut strips of wax tape and apply them around all bolts, nuts, mechanical joint restraints, and other irregular shapes so that there are no voids or spaces under the tape. Apply a sufficient amount of tape to completely encapsulate all exposed steel surfaces. The minimum wax tape thickness shall be 70 mils over smooth surfaces and 140 mils over sharp and irregular surfaces, or of a thickness required to fill all voids. Apply two layers of polyvinylidene chloride, high cling membrane sheet over the wax tape coating by tightly wrapping it around the pipe such that it adheres and conforms to the wax tape. Secure the plastic wrap to the pipe with adhesive tape.

E. Polyethylene Encasement

1. Encase all buried DI piping, pipe fittings, valves and appurtenances in polyethylene to prevent contact with surrounding backfill material per the requirements of AWWA C105.

2. Encase DI fittings, valves, and appurtenances in polyethylene after wax tape coating system has been applied as specified herein.

F. Thrust Restraints:

1. Provide valves, tees, bends, caps, and plugs with concrete thrust blocks at locations shown in the Drawings and as required to facilitate testing of lines.

2. Pour concrete thrust blocks against undisturbed earth.

3. Locate thrust blocks to ensure that pipe and fitting joints will be accessible for repair.

4. Provide thrust restraint bearing area on subsoil as shown in details within the Drawings.

5. Install tie rods, clamps, setscrew retainer glands, or restrained joints.

6. Protect metal-restrained joint components against corrosion with polyethylene film as specified herein.

7. Do not encase pipe and fitting joints to flanges.

G. Backfilling:

1. Backfill of piping systems shall be as specified in Section 31 23 17, Trenching.

H. Testing and Disinfection of Potable Water Piping System:

1. In accordance with AWWA C600 and AWWA C651 and as specified in Section 33 13 00, Testing and Disinfecting of Water Utility Distribution.

2. All chlorinated water used in disinfection of the water main shall either be discharged through an approved connection to a public sanitary sewer system or shall be dechlorinated to limits acceptable by the Oregon State Department of Environmental Quality (DEQ) prior to discharge into any storm drainage system or open drainage way.

3. No chlorinated water shall be discharged into a storm drainage system or open drainage way without a dechlorination under a plan meeting DEQ's requirements.

3.4 FIELD QUALITY CONTROL

A. Compaction Testing: See Section 31 23 17, Trenching for Compaction Testing requirements for piping trenches.

END OF SECTION

SECTION 33 11 50

EXISTING PIPE ABANDONMENT

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes the removal of existing buried piping and abandonment in place of existing buried piping.

B. A portion of the existing buried and previously abandoned piping to be removed from the West Avenue is coated with coal tar epoxy coating wrap system which contains asbestos. This work shall include permits, mobilization of equipment, insurance coverage, bonding, preparation of job site, preparing site staging area, security measures, and clean-up necessary for satisfactory completion of work.

C. Section includes:

1. Pipe removal.
2. In-place abandonment of pipe.
3. Asbestos abatement requirements for buried pipe removal

1.2 RELATED SECTIONS

A. Section 03 60 00 - Grouting
B. Section 31 23 16 - Excavation
C. Section 31 23 17 - Trenching
D. Section 31 23 19 – Dewatering

1.3 SUBMITTALS

A. Provide all submittals in accordance with Section 01 33 00, Submittal Procedures.

B. Piping Abandonment Plan:

1. Identify locations specified for pipe abandonment.
2. Provide method to be utilized to abandon the pipe, including whether the pipe will be left in place or removed in its entirety.

C. Provide an asbestos management plan containing the following information, and as required in Subsection 3.4.

1. Submit qualifications of company(s) that demonstrate an accredited asbestos surveyor will complete an asbestos survey of the affected area of the site including a bulk sample of the waterproofing material and concrete substrate.

2. Submit qualifications of company(s) that demonstrate a licensed asbestos abatement Contractor will properly handle, remove, and dispose of asbestos material to be removed as part of this project.

3. Submit documentation certifying the proper handling and disposal of the asbestos material to be removed as part of this project.

D. Non-Shrink Grout: Product data in accordance with Section 03 60 00, Grouting.

E. CLSM: Mix designs in accordance with Submittal requirements of Section 31 23 24, Flowable Fill.

1.4 REQUIREMENTS OF REGULATORY AGENCIES

A. Permits -- The CONTRACTOR is responsible for obtaining all necessary permits required for completion of the work described herein at no cost to the OWNER. Permits may include, but are not limited to, a DEQ ASN1 notification, a DEQ ASN6 notification, and an application to DEQ for any variances, if applicable, that includes, but is not limited to, all required paperwork, work practices and proposed procedures clearly documented for approval by DEQ.

B. Protection of Persons and Property: Meet all federal, state and local safety requirements for the protection of workmen, other persons, and property in the vicinity of the work and requirements of the General Provisions.

1.5 PROTECTION OF EXISTING WORK

A. Carefully examine the Contract Documents to determine the extent of the work of this Section.

B. Carefully coordinate the work of this Section with all other work and construction.

C. Take all necessary precautions to prevent damage to existing facilities or utilities which are to remain in place, and be responsible for any damages to existing facilities or utilities, which are caused by the operations.

1.6 REPAIR OF DAMAGE

A. Work procedures shall provide for safe conduct of the work; careful removal and disposition of materials and equipment; protection of facilities, utilities and property which are to remain undisturbed; coordination with existing facilities and utilities to remain in service.

B. Any damage to existing facilities or utilities to remain as caused by the Contractor's operations shall be repaired to acceptance of Engineer.

C. Damaged items shall be repaired or replaced with new materials as required to restore damaged items or surfaces to a condition equal to and matching that existing prior to damage or start of work of this contract.

1.7 EXISTING CONDITIONS

A. If the pipe material contains any hazardous materials, such as asbestos, requiring special handling upon removal, it is the responsibility of the Contractor to remove and dispose of the material in accordance with all applicable federal, state and local regulations.

PART 2 PRODUCTS

2.1 OWNERSHIP OF EXISTING MATERIALS

A. All materials, equipment, miscellaneous items and debris involved, occurring or resulting from pipe removal work shall become the property of the Contractor at the place of origin, unless otherwise specified in the Drawings or by the Engineer.

2.2 CONTROLLED LOW STRENGTH MATERIAL

A. As specified in Section 31 23 24, Flowable Fill.

PART 3 EXECUTION

3.1 PIPE REMOVAL (WITHOUT ASBESTOS; SEE SUBSECTION 3.4 FOR WITH ASBESTOS)

A. Where identified on the Drawings, remove and dispose of all pipe material and associated appurtenances.

1. All fire hydrants, air release valves service lines and appurtenances being abandoned shall be removed to 36 inches below finished grade.

2. Existing service line appurtenances, including valve and meter boxes, shall be removed to 36 inches below finished grade.

B. All exposed ends of pipes and fittings to remain in service shall be capped or plugged with an appropriate ductile iron blind flange, cap or plug and restrained.

1. A pipe shall be considered in service if it is possible to flood the pipe with water by opening valves in the water system.

C. All excavation and backfilling associated with pipe removal shall be performed in accordance with 31 23 33, Trenching.

3.2 IN-PLACE ABANDONMENT OF PIPING

A. Where identified on the Drawings, abandon pipe in place.

B. All exposed ends of pipes being abandoned in place shall be cut and plugged with a minimum of two (2) feet of non-shrink grout.

C. Prior to placing grout, roughen interior pipe surface and apply epoxy bonding agent.

3.3 FILLING PIPE WITH CLSM

A. Where identified on the Plans, pipes greater than 12 inches in diameter to be abandoned-in-place shall be filled with CLSM.

B. CLSM shall be placed in a manner to ensure complete filling of the pipe, leaving no cavities or voids.

C. Install hot taps, saddles, fill lines and appurtenances as necessary for pumping CLSM from the surface into the pipe being filled.

D. CLSM shall be pumped up grade from fill lines rigidly connected to the pipes being filled.

E. Placement of CLSM by free-flowing (non-pumped) methods will not be acceptable.

F. Fill lines shall be located at elevations lower than the pipe being filled.

G. As the CLSM is being placed, use other fill lines as view ports to ensure complete filling of the pipes.

H. Relocate pumping equipment as necessary to complete filling of the pipes.

I. Excavate and cut access holes in the pipes as necessary to complete filling operations.

J. Perform pipe filling operations in a manner to eliminate all air pockets.

K. Submit volume calculations for CLSM placed in each filled segment of piping to verify that pipelines have been completely filled.

3.4 REMOVAL AND DISPOSAL OF EXISTING ABANDONED PIPING ON WEST AVENUE WITH COAL TAR COATING CONTAINING ASBESTOS

A. When piping on West Avenue with coal tar coating containing asbestos is to be removed and disposed of the CONTRACTOR shall comply with OAR 340-248, ORS

468A.700 to 468A.760, and all Oregon DEQ rules and regulations. The pipe with coating containing asbestos material shall be disposed of together as hazardous waste if required to comply with all applicable Oregon DEQ requirements as enforced by the OAR.

All pipe coating material that contains asbestos shall be handled in such a manner to ensure removal from the reservoir site without causing the release of free asbestos fibers.

Contractor shall remove and dispose of all asbestos containing materials encountered, except that may remain buried, undisturbed and abandoned in-place per the project specifications. Contractor is responsible for proper identification, handling, and disposal of asbestos materials. Contractor shall provide properly trained and certified workers and shall be prepared to deal with both friable and non-friable forms of asbestos. Permit and permit fees related to this work shall be the Contractor's responsibility. Contractor is solely responsible for pursuing work in a way that is consistent with all state, local, and federal rules, regulations and guidelines. An asbestos management plan shall be provided to engineer a minimum of four weeks prior to the work being performed and shall address the following:

- Personnel training and experience
- Subcontracted specialists including contact information
- Anticipated work scope and contingency measures
- Worker Safety and OSHA compliance
- Plan for DEQ Permitting and Compliance
- Plan for removal and disposal of friable material
- Plan for remove and disposal of non-friable material

The Contractor shall remove all asbestos contaminated material from the project site for disposal at a landfill licensed to handle asbestos waste.

3.5 CLEANUP

A. During and upon completion of work of this Section, promptly remove all unused tools and equipment, surplus materials and debris.

B. Adjacent areas shall be returned to their existing condition prior to the start of work.

END OF SECTION

SECTION 33 12 16

WATER UTILITY DISTRIBUTION & TRANSMISSION VALVES

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes valves and valve boxes for installation with buried water distribution and transmission main, including fire hydrants and tapping sleeves.

B. Section Includes:

1. Valves.
2. Valve boxes.
3. Valve operator extensions.

C. Related Requirements:

1. Section 03 11 00 – Concrete Work
2. Section 33 11 10 - Water Utility Distribution & Transmission Piping
3. Section 33 13 00 - Testing and Disinfecting of Water Utility Distribution

1.2 REFERENCE STANDARDS

A. American Society of Mechanical Engineers:

1. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.

2. ASME B16.5 - Pipe Flanges and Flanged Fittings, Steel Nickel Alloy and other Special Alloys.

3. ASME 1.20.1 - General Purpose Pipe Threads (Inch)

B. American Water Works Association:

1. AWWA C504 - Rubber-Seated Butterfly Valves, 3 In. Through 72 In.
2. AWWA C509 - Resilient-Seated Gate Valves for Water Supply Service.
3. AWWA C550 - Protecting Interior Coatings for Valves and Hydrants.
4. AWWA C600 - Installation of Ductile-Iron Mains and Their Appurtenances.
5. AWWA C605 - Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings.

C. ASTM International:

1. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings.

2. ASTM B584 - Standard Specification for Copper Alloy Sand Castings for General Applications.

D. NSF International:

1. NSF 61 - Drinking Water System Components - Health Effects.
2. NSF 372 - Drinking Water System Components - Lead Content.

1.3 COORDINATION

A. The Contractor shall cause the Supplier of valves to coordinate installation such that all pipes, valves, fittings, appurtenances and equipment are compatible and capable of achieving the performance requirements specified in the Contract Documents.

B. Coordinate Work of this Section with the City of Roseburg Public Works Department standards and utilities within construction area.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit manufacturer's latest published literature. Include illustrations, installation and maintenance instructions, and parts lists.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Manufacturer Instructions: Submit detailed instructions on installation requirements, including storage and handling procedures.

E. Lining and coating data.

F. Valve Labeling: Schedule of valves to be labeled indicating in each case the valve location and the proposed labeling for the valve.

G. Certification of Valves Larger than 12 inches: Furnish certified copies of hydrostatic factory tests, indicating compliance with applicable standards.

H. Source Quality-Control Submittals: Indicate results of factory tests and inspections.

I. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

1.5 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of valves.

B. Operation and Maintenance Data: Submit information for valves.

1.6 QUALITY ASSURANCE

A. Cast manufacturer's name, maximum working pressure, size of valve and year of fabrication into valve body.

B. Valve Testing: Each valve body shall be tested under a test pressure equal to twice its design water-working pressure.

C. Certification: Prior to shipment, submit for all valves over 12 inches in diameter, certified, notarized copies of the hydrostatic factory tests, showing compliance with the applicable standards of AWWA, ANSI, ASTM, etc. Valves tested and supplied shall be trackable and traceable by serial number, tagged or otherwise noted on valve, upon arrival to Site.

D. Unless otherwise noted, all water works materials provided for the Project shall be new, of first class quality and shall be made by reputable manufacturers.

E. All material of a like kind shall be provided from a single manufacturer, unless otherwise approved by the Engineer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves and accessories for shipment according to applicable AWWA standards.

B. Seal valve and ends to prevent entry of foreign matter.

C. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

D. Storage:

1. Store materials in areas protected from weather, moisture, or other potential damage.

2. Do not store materials directly on ground.

E. Handle products carefully to prevent damage to interior or exterior surfaces.

F. All defective or damaged materials shall be replaced with new materials at no cost to the Owner.

PART 2 PRODUCTS

2.1 GENERAL

A. All materials in contact with potable water shall conform to ANSI/NSF Standard 61 and meet the “lead free” requirements of the Safe Drinking Water Act amendment, effective January 4, 2014, as per the lead content evaluation procedures outlined in NSF/ANSI Standard 372.1.

1. All fittings shall either be cast or permanently stamped with markings identifying the item as complying with NSF 61 per the requirements of NSF 372 for “lead free”.

2. All brass in contact with potable water shall comply with ASTM B584.

2.2 RESILIENT WEDGE GATE VALVES

A. As specified in Section 40 05 23.15, Gate Valves.

B. Connecting Hardware:

1. As specified in Article 2.3, Nuts, Bolts and Washers of Section 33 11 10, Water Utility Distribution & Transmission Piping.

C. Gaskets:

1. As required for the end connection types specified in Section 33 11 10, Water Utility Distribution & Transmission Piping.

2.3 RUBBER-SEATED BUTTERFLY VALVES

A. As specified in Section 40 05 23.18, Butterfly Valves.

B. Operation:

1. All buried valves shall be provided with 2-inch square operating nuts.

C. Connecting Hardware:

1. As specified in Article 2.3, Nuts, Bolts and Washers of Section 33 11 10, Water Utility Distribution & Transmission Piping.

D. Gaskets:

1. As required for the end connection types specified in Section 33 11 10, Water Utility Distribution & Transmission Piping.

2.4 ACTUATORS

A. Unless otherwise indicated, all valves shall be furnished with manual actuators.

B. Actuators shall be sized for the valve design pressure in accordance with AWWA C504.

C. All gear-assisted valves that are buried and submerged shall have the actuators hermetically-sealed and grease-packed.

D. All valves 6 inches to 30 inches in diameter may have traveling-nut actuators, worm-gear actuators, spur- or bevel-gear actuators, as appropriate for each valve.

2.5 VALVE BOXES

A. Provide all buried valves with valve boxes, covers and risers.

B. Valve Boxes:

1. Materials: Cast iron.

2. Construction:

   a. Walls not less than 3/16-inch thick at any point.
   b. Internal diameter not less than 5 inches.

3. Type: Two-piece extension.

4. Manufacturers:

   a. Olympic Foundry.
   b. Brooks Products.

C. Covers:

1. Construction:

   a. Prevents dislodging and rotation from traffic.
   b. Allows a hand held pry bar to be applied for easy removal.

2. Materials: Cast iron.

3. Lid Inscription: “WATER” or “W”.

4. Manufacturers: Matching that of valve box.

D. Riser:

1. PVC Pipe:

a. ASTM D3034, SDR 35 PVC.
b. White, Schedule 40, 8-inch diameter.
c. Length as shown on details in the Drawings.

2.6 VALVE OPERATOR EXTENSIONS

A. As shown in the Drawings.

B. Provide operator extensions to a maximum of 12 inches below grade where depth to valve exceeds 36 inches.

2.7 ACCESSORIES

A. Concrete for Thrust Restraints: Concrete type as specified in Section 03 30 00, Cast-in-Place Concrete.

PART 3 EXECUTION

3.1 PREPARATION

A. Conduct operations to not interfere with, interrupt, damage, destroy, or endanger integrity of surface or subsurface structures, utilities, and landscape in immediate or adjacent areas.

B. Identify required lines, levels, contours, and datum locations.

C. Locate, identify, and protect from damage utilities to remain.

D. Access:

1. All valves shall be installed to provide easy access for operation, removal, and maintenance.

2. Avoid conflicts between valve operators and above grade construction such as structural members or handrails.

E. Valve Accessories:

1. Where combinations of valves, sensors, switches, and controls are specified, it shall be the responsibility of the Contractor to properly assemble and install these various items so that all systems are compatible and operating properly.

2. The relationship between interrelated items shall be clearly noted on shop drawing submittals.

3.2 INSTALLATION

A. General:

1. All valves, operating units, stem extensions, valve boxes, and accessories shall be installed in accordance with the manufacturer's written instructions and as shown in the Drawings and as specified herein.

2. Valves shall be firmly supported to avoid undue stresses on the pipe.

3. Stem extensions shall be braced at no greater than 10 feet intervals and be provided with double universal joints to allow for misalignment, where applicable.

B. Perform trench excavation, backfilling, and compaction as specified in Section 33 11 10, Water Utility Distribution & Transmission Piping.

C. Install valves in conjunction with pipe laying.

D. Set valves plumb.

E. Provide buried valves with valve boxes installed flush with finished grade.

1. Valves installed out of paved or otherwise hard-surfaced areas shall be set in a concrete pad at finished grade.

2. Concrete valve box pads shall be 18 inches square and be not less than 6 inches thick.

F. Disinfection of Water Piping System:

1. Flush and disinfect system as specified in Section 33 13 00, Testing and Disinfecting of Water Utility Distribution.

3.3 FIELD QUALITY CONTROL

A. Pressure test valving for water distribution system according to AWWA C600 and in accordance with Section 33 13 00, Testing and Disinfecting of Water Utility Distribution.

B. Field Testing of Valves:

1. All valves 24-inch diameter or larger, and all in-line transmission main valves, shall be pressure and leakage tested at the Site and shall pass the field testing prior to installation.

2. Valves shall be tested at 1.5 times normal operating pressure, 150 psi minimum.

3. No valve shall be accepted for installation that fails to pass the field pressure test. Any valves failing field pressure tests shall be replaced by the Contractor at no additional cost to the Owner.

4. Engineer shall witness field testing.

END OF SECTION

SECTION 33 13 00

TESTING & DISINFECTION OF WATER UTILITY PIPING

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes hydrostatic pressure testing, disinfection and purity testing of potable water systems piping, fittings, valves, and domestic water services.

B. Section Includes:

1. Pressure testing and disinfection of potable water distribution and transmission piping systems and appurtenances.

2. Testing and reporting of results.

C. Related Requirements:

1. Section 33 11 10 - Water Utility Distribution & Transmission Piping
2. Section 33 12 16 - Water Utility Distribution & Transmission Valves

1.2 REFERENCE STANDARDS

A. American Water Works Association:

1. AWWA B300 - Hypochlorites.
2. AWWA B301 - Liquid Chlorine.
3. AWWA C600 - Installation of Ductile-Iron Mains and Their Appurtenances.
4. AWWA C651 - Disinfecting Water Mains.
5. AWWA C655 - Field Dechlorination.

1.3 SUBMITTALS

A. Section 01 33 00 – Contractor Submittals: Requirements for submittals.

B. Product Data: Submit procedures, proposed chemicals, and treatment levels.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Pipeline Testing & Disinfection Plan: To be submitted for review and approval by the Engineer a minimum of one month before testing is to start. As a minimum, the plan shall include the following:

1. Testing schedule.

2. Hydrostatic Testing Plan:

    a. Narrative of the proposed process.
    b. Proposed equipment to be used.
    c. Disposal location for excess water used to fill mains.

3. Disinfection Plan:

    a. Narrative of the proposed process.

    b. Proposed chemicals and equipment (including list of all pumps and meters) to be used.

    c. Calculations for the amount of chlorine required to achieve required chlorine residual levels.

    d. Proposed method of mixing, injecting and distributing of chlorine solution throughout all portions of the new water system facilities.

    e. Proposed plan for testing chlorine levels throughout the length of pipeline.

4. Proposed testing locations.

5. Proposed plan for water conveyance, including flow rates.

6. Proposed plan for water control.

7. Proposed plan for water disposal, including flow rates. Include proposed plan for dechlorination of disinfection water, including discharge points.

8. Proposed measures to be incorporated in the project to minimize erosion while discharging water from the pipeline.

1.4 CLOSEOUT SUBMITTALS

A. Disinfection Report:

1. Type and form of disinfectant used.

2. Date and time of disinfectant injection start and time of completion.

3. Test locations.

4. Name of person collecting samples.

5. Initial and 24-hour disinfectant residuals in treated water in ppm for each outlet tested.

6. Date and time of flushing start and completion.

7. Disinfectant residual after flushing in ppm for each outlet tested.

1.5 QUALITY ASSURANCE

A. Perform Work according to AWWA C651.

PART 2 PRODUCTS

2.1 EQUIPMENT

A. All test equipment, chemicals for chlorination, temporary valves, bulkheads, or other water control equipment and materials shall be determined and furnished by the Contractor subject to the Engineer's review. No materials shall be used which would be injurious to the construction or its future functions.

B. All temporary thrust restraint and equipment and facilities required for hydrostatic testing will be considered incidental.

C. As a minimum, furnish the following equipment and materials for the testing:

Amount	Description
2	Graduated containers approved by the Engineer.
1	Hydraulic pump approved by the Engineer with hoses, valves and fittings as needed and required for the testing and disinfection of the facilities.
1	High range chlorine test kit, as approved by Engineer, with digital readout. Range of detection shall be between 5 & 200 ppm. Accuracy of 3%.
2	Pressure gauges with pressure range at least 120% greater than the required maximum test pressure with graduations in two (2) psi increments. Gauges shall have been calibrated with 90 days of pressure testing.

2.2 DISINFECTION CHEMICALS

A. Chemicals:

1. Hypochlorite: Comply with AWWA B300.
2. Liquid chlorine: Comply with AWWA B301.

2.3 DECHLORINATION CHEMICALS

A. Chemicals:

1. Comply with AWWA C655.

PART 3 EXECUTION

3.1 HYDROSTATIC TESTING OF WATER PIPING

A. Make all necessary provisions for conveying water to the points of use and for the disposal of test water.

B. No section of the pipeline shall be hydrostatically tested until backfill has been placed, compacted and passed required density testing and all field-placed concrete or mortar has attained full strength.

1. At the Contractor's option, early strength concrete may be used when the full strength requirements conflict with schedule requirements.

2. All such substitutions and installations shall be approved by the Engineer prior to installation.

C. Provide 72-hour notification to the Engineer and Owner prior to conducting hydrostatic testing.

1. Provide coordination and scheduling required for the Owner and Engineer to witness and provide necessary labor for operating Owner's existing system during hydrostatic testing and disinfecting procedures.

2. The Contractor shall not operate any part of the existing water systems.

D. Pipe Filling:

1. Fill pipes slowly from the lowest elevation to highest point along test section with potable water.

2. Take all required precautions to prevent entrapping air in the pipes.

3. Allow for natural absorption of water by the lining of the pipe to occur.

4. Apply specified test pressure by pumping.

E. Testing of Mains:

1. Ductile Iron: In accordance with AWWA C600.

2. PVC: In accordance with AWWA C605.

3. General:

   a. Tests shall be conducted under a hydrostatic test pressure not less than 1.25 times the stated anticipated maximum sustained working pressure of the pipeline measured at the highest elevation along the test section and not less than 1.5 times the stated working pressure at the lowest elevation of the test section, minimum 150 psi, unless otherwise shown in the Drawings.

   b. In no case shall the test pressure exceed the rated working pressure for any joint, thrust restraint, valve, fitting, or other connected appurtenance of the test section.

   c. Testing shall be performed by applying the specified test pressure by pumping.

   d. Once the test pressure has been attained, the pump shall be valved off.

   e. The test will be conducted for a two-hour period with the allowable leakage not to exceed the value as calculated per the Allowable Leakage formula below.

   f. During the test period, there shall be no appreciable or abrupt loss in pressure.

4. Allowable Leakage:

   a. Flanged Joints: Pipe, fittings and valves with flanged joints shall be completely watertight. No leakage allowed.

   b. Mechanical or Push-on Joints: Pipe, fittings and valves with rubber gasketed joints shall have a measured loss not to exceed the rate given in the following Allowable Leakage formula:

      $$AL = \frac{LD(P)^{1/2}}{148{,}000}$$

      In the above formula:

      AL = Allowable leakage, in gallons per hour
      L = Length of pipe tested, in feet
      D = Nominal diameter of pipe, in inches
      P = Average test pressure during the leakage test, in pounds per square inch.

5. Maintaining Pressure:

a. During the test period, operate the pump as required to maintain pressure in the pipe within 5 psi of the specified test pressure at all times.

b. At the end of test period, operate the pump until the specified test pressure is again obtained.

1) The pump suction shall be in a clean, graduated barrel or similar device or metered so that the amount of water required to restore the test pressure may be accurately measured.

2) Sterilize this makeup water by adding chlorine to a concentration of 25 mg/L.

c. The Engineer will determine the quantity of water required to maintain and restore the required pressure at the end of the test period.

d. Each hour's loss stands on its own and will not be averaged.

6. Defects, Leakage, Failure:

a. If the test reveals any defects, leakage in excess of the allowable, or failure, furnish all labor, equipment and materials required to locate and make necessary repairs.

b. Correct any visible leakage regardless of the allowable leakage specified above.

c. All leaks shall be repaired in a manner acceptable to the Engineer.

d. The testing of the line shall be repeated until a test satisfactory to the Engineer has been achieved.

3.2 DISINFECTION OF WATER PIPING

A. Disinfection shall be in accordance with the latest version of AWWA C651 following Engineer's acceptance of hydrostatic testing.

B. Chlorination by means of tablets or powders (calcium hypochlorite) placed in each length of pipe during installation is specifically prohibited.

C. Flush all foreign matter from the pipeline, branches and services.

1. Provide at no additional cost to the Owner, hoses, temporary pipes, ditches, etc., as required to dispose of flushing water without damage to adjacent properties.

2. Flushing velocities shall be at least 2.5 feet per second (fps).

3. For large diameter pipe where it is impractical or impossible to flush the pipe at 2.5 fps velocity, clean the pipe in place from the inside by brushing and sweeping, then flush the line at a lower velocity.

D. Chlorine Application:

1. Fill the test section of main from the lowest elevation and maintain a steady flow rate while injecting the water main with chlorinated water.

2. Flow (bleed) a blow-off, standpipe or hydrant at the water main's high point(s) to allow air to escape and ensure all interior pipe surfaces are wetted.

E. Chlorine Residual:

1. Measure chlorine residual with a high-range chlorine test kit at a point near to the injection point while filling the main.

2. Adjust the dose rate as necessary to maintain the target dose rate.

F. Potable water piping shall be disinfected with a solution containing a minimum 25 parts per million (ppm) and a maximum 50 ppm chlorine.

1. Once the main is completely filled with super-chlorinated water, measure the chlorine residual a minimum of once every 200 feet of main and once for each main branch, 2-inch service or as directed by the Engineer.

2. The chlorine solution shall remain in the piping system for a period of 24 hours, after which time the sterilizing mixture shall have a strength of at least 10 ppm of chlorine.

3. If check samples fail to produce acceptable results, the disinfection procedure shall be repeated at the expense of the Contractor until satisfactory results are obtained.

G. Flush piping, branches and services with municipal potable water until the chlorine residual is below 1.5 ppm and approximately the same as the source water.

1. There is no minimum flushing velocity for this step.

H. Disposal of any water containing chlorine shall be performed in accordance with the latest edition of AWWA C651 and C655, and all state or local requirements.

1. Disposal may be made into existing sanitary sewer systems providing approvals are obtained from the respective system owners.

2. Any chlorinated water discharged to open stream channels must be dechlorinated prior to discharge to levels acceptable by Oregon State Department of Environmental Quality (DEQ).

3.3 DISINFECTION & TESTING OF WATER MAIN END CONNECTIONS AND TIE-INS

A. Disinfection of potable water piping and appurtenances at end connections and tie-ins to the existing system which are required to remain in service due to restrictions in allowable shutdown time shall be disinfected as described below.

B. Prior to connecting new potable water piping and appurtenances with existing piping and appurtenances, the interior of all new pipe, fittings, valves and appurtenances shall be swabbed or sprayed with a 1% to 5% percent calcium hypochlorite solution.

C. In accordance with AWWA C651, swabbing or spraying of connection piping is allowed only if the total length of piping is equal to or less than one pipe length (18 feet). All runs of new piping over 18 feet in total length will require hydrostatic pressure testing, flushing and disinfection as detailed elsewhere in this Section.

D. Following the disinfection procedures described above, connection of the new piping and appurtenances to the existing water system shall be made.

1. During the system startup, the Engineer and Contractor shall visually inspect all new fittings, piping, valves and appurtenances for evidence of leakage.

2. Any leakage observed during this period shall be promptly repaired by the Contractor, at Contractor's expense, as required by the Engineer.

3.4 FIELD QUALITY CONTROL

A. Bacteriological Sampling and Testing:

1. The Owner will collect samples after the line is flushed in accordance with the latest edition of AWWA C651.

a. The locations for sample collection shall be at the sole discretion of the Owner and Engineer.

b. The chlorine residual must be below 1.5 ppm, or restored to the level maintained in the Owner's distribution system, when the sample is taken.

2. Bacterial Testing: After completing the chlorination procedure, test the main according to the following:

a. Bacterial Sampling

1) Option A:

a) Take an initial set of samples using sampling site procedures outlined herein.

b) Resample after a minimum of 24 hours' time has elapsed using sampling site procedures outlined herein.

c) Both sets of successive samples must pass for the main to be approved for service.

2) Option B:

a) Allow main to sit for a minimum of 24 hours without any water use.

b) Using sampling site procedures outlined herein, collect two sets of samples a minimum of 15 minutes apart while the sampling taps are left running.

c) Both sets of samples must pass for the main to be approved for service.

3) Allow 24 hours for the test results for each sample set.

b. Sampling Locations

1) The Owner will take one bacteriological sample from the end of the main and on each branch.

2) For long runs of main, at least one sample will be taken for every 1,200 feet of new main and as directed.

c. Sample Testing

1) The Owner will test the sample set for coliform bacteria and publish the test results within 24 hours.

d. Evaluating the Test Results

1) If one or more of the sample set tests positive for coliforms (fails), repeat chlorination and sampling processes specified herein after correcting the cause of the failure and as directed by the Engineer.

2) When two consecutive sample sets test negative (passing)for coliform bacteria, the bacterial testing is complete.

e. Completion of Bacterial Testing

1) Upon completion of bacterial testing, notify the Owner shall notify the Engineer and Contractor in writing that the testing is complete and the main is ready for tie-in.

f. Multiple Positive (Failing) Test Results

1) If sample sets continue to test positive for coliforms, the Engineer will determine how to proceed, up to and including repeating the chlorination procedure or rejecting the pipe.

3. Results of the bacteriological testing shall be satisfactory with the Oregon Health Authority and/or other appropriate regulatory agencies, or disinfection shall be repeated by the Contractor.

B. Optional Sampling and Testing

1. If a pipeline is not promptly returned to service, the situation will be evaluated by the Owner to determine if the water quality may have been impacted and if additional testing as specified herein is warranted.

END OF SECTION

SECTION 40 05 23.15

GATE VALVES

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes gate valves for use in buried service and utility vaults. Coordinate with Section 33 12 16, Water Utility Distribution & Transmission Valves.

B. Section Includes:

1. Resilient-seated gate valves.

2. General duty gate valves smaller than 3 inches.

1.2 RELATED SECTIONS

A. Section 33 11 10 - Water Utility Distribution & Transmission Piping
B. Section 33 12 16 - Water Utility Distribution & Transmission Valves
C. Section 33 13 00 - Testing and Disinfection of Water Utility Piping

1.3 REFERENCE STANDARDS

A. American Society of Mechanical Engineers:

1. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings.

2. ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through 24 - Metric/Inch Standard.

3. ASME B16.42 - Ductile Iron Pipe Flanges and Flanged Fittings: Classes 150 and 300.

4. ASME B1.20.1 - Pipe Threads, General Purpose (Inch).

B. ASTM International:

1. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.

2. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings.

3. ASTM B584 - Standard Specification for Copper Alloy Sand Castings for General Applications.

C. American Water Works Association:

1. AWWA C509 - Resilient-Seated Gate Valves for Water Supply Service.
2. AWWA C550 - Protecting Interior Coatings for Valves and Hydrants.

D. Manufacturers Standardization Society of the Valve and Fittings Industry:

1. MSS SP-70 - Gray Iron Gate Valves, Flanged and Threaded Ends.
2. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves.

E. National Sanitation Foundation International:

1. NSF/ANSI Standard 61 - Drinking Water System Components - Health Effects

2. NSF/ANSI Standard 372 - Drinking Water System Components - Lead Content

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. As required by Section 33 12 16, Water Utility Distribution & Transmission Valves.

PART 2 PRODUCTS

2.1 GENERAL

A. All materials in contact with potable water shall conform to ANSI/NSF Standard 61 and meet the “lead free” requirements of the Safe Drinking Water Act amendment, effective January 4, 2014, as per the lead content evaluation procedures outlined in NSF/ANSI Standard 372.1.

1. All fittings shall either be cast or permanently stamped with markings identifying the item as complying with NSF 61 per the requirements of NSF 372 for “lead free”.

2. All brass in contact with potable water shall comply with ASTM B584.

2.2 RESILIENT-SEATED GATE VALVES

A. Description:

1. Comply with AWWA C509.

2. Minimum Pressure Rating:

a. 12-inch Diameter and Smaller: 200 psig.
b. 16-inch Diameter and Larger: 150 psig.

3. End Connections: As shown in the Drawings.

   a. Standard mechanical joint ends comply with ANSI/AWWA C111.

   b. Flanged end dimensions and drilling comply with ANSI/ASME B16.1, class 125. Comply with AWWA C115 & ASME 16.5.

      1) The Contractor shall coordinate with pipe, valve and fitting suppliers to make certain pipe, valve and fitting flanges match in bolt pattern.

4. Gear Actuators: Conforming to AWWA C509 for manual valves.

5. Linings and Coatings:

   a. Corrosion-resistant fusion bonded epoxy conforming to AWWA C550 and NSF 61.

   b. All internal and external ferrous surfaces.

   c. Do not coat flange faces of valves.

6. Bi-directional flow.

B. Operation:

1. Non-rising stem.

2. Open counterclockwise when viewing the valve from above, unless otherwise indicated in the Drawings.

3. Buried Valves: All buried valves shall be provided with 2-inch square operating nuts.

4. In-Plant Service Valves: Valves for in-plant or exposed service shall be furnished with handwheel operators, unless otherwise specified in Section 40 05 23, Common Work Results for Process Valves.

C. Materials:

1. Wedge:

   a. ASTM A126, cast iron or ASTM A536, ductile iron.

   b. Fully encapsulated with molded rubber.

2. Body and Bonnet:

    a. ASTM A126, cast iron or ASTM A536, ductile iron.

3. Stem, Stem Nuts, Glands, and Bushings: ASTM B584, bronze.

4. Valve Body Bolting: Stainless steel.

D. Manufacturers:

1. Clow Valve Company.

2. M&H Valve.

3. U.S. Pipe.

4. American Flow Control.

5. Mueller Company.

2.3 GENERAL-DUTY GATE VALVES - SMALLER THAN 3 INCHES

A. 2 inches and Smaller:

1. MSS SP 80, Class 125.
2. Body and Trim: ASTM B584, bronze.
3. Bonnet: Union.
4. Operation: Handwheel.
5. Inside screw [with back-seating stem].
6. Wedge Disc: Solid; ASTM B584, bronze.
7. End Connections: Threaded.

B. 2-1/2 inches to 3 inches:

1. MSS SP 70, Class 125.
2. Stem: Non-rising.
3. Body: ASTM A126, cast iron.
4. Trim: Bronze.
5. Bonnet: Bolted bonnet.
6. Handwheel, outside screw and yoke.
7. Wedge Disc: Solid, with bronze seat rings.
8. End Connections: ASME B16.1, ASME B16.5, ASME B16.42, flanged.

2.4 SOURCE QUALITY CONTROL

A. Testing: Test gate valves according to AWWA C509.

PART 3 EXECUTION

3.1 INSTALLATION

A. As required by Section 33 12 16, Water Utility Distribution & Transmission Valves.

B. Install according to manufacturer's instructions.

C. Support valves in plastic piping to prevent undue stresses on piping.

END OF SECTION

SECTION 40 05 23.18

BUTTERFLY VALVES

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes butterfly valves for use in buried service and utility vaults. Coordinate with Section 33 12 16, Water Utility Distribution & Transmission Valves.

B. Section Includes:

1. Rubber-seated butterfly valves.

1.2 RELATED SECTIONS

A. Section 33 11 10 - Water Utility Distribution & Transmission Piping
B. Section 33 12 16 - Water Utility Distribution & Transmission Valves
C. Section 33 13 00 - Testing and Disinfection of Water Utility Piping

1.3 REFERENCE STANDARDS

A. American Society of Mechanical Engineers:

1. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings.

2. ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through 24 - Metric/Inch Standard.

3. ASME B16.42 - Ductile Iron Pipe Flanges and Flanged Fittings: Classes 150 and 300.

B. ASTM International:

1. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.

2. ASTM A536 - Standard Specification for Ductile Iron Castings.

3. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings.

4. ASTM B584 - Standard Specification for Copper Alloy Sand Castings for General Applications.

C. American Water Works Association:

1. AWWA C504 - Rubber-Seated Butterfly Valves, 3 In. (75 mm) Through 72 In. (1,800 mm).

2. AWWA C550 - Protecting Interior Coatings for Valves and Hydrants.

D. National Sanitation Foundation International:

1. NSF/ANSI Standard 61 - Drinking Water System Components - Health Effects

2. NSF/ANSI Standard 372 - Drinking Water System Components - Lead Content

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. As required by Section 33 12 16, Water Utility Distribution & Transmission Valves.

PART 2 PRODUCTS

2.1 GENERAL

A. All materials in contact with potable water shall conform to ANSI/NSF Standard 61 and meet the “lead free” requirements of the Safe Drinking Water Act amendment, effective January 4, 2014, as per the lead content evaluation procedures outlined in NSF/ANSI Standard 372.1.

1. All fittings shall either be cast or permanently stamped with markings identifying the item as complying with NSF 61 per the requirements of NSF 372 for “lead free”.

2. All brass in contact with potable water shall comply with ASTM B584.

2.2 RUBBER-SEATED BUTTERFLY VALVES

A. Description:

1. Comply with AWWA C504, Class 150B.

2. Minimum Pressure Rating:

a. 12-inch (300-mm) Diameter and Smaller: 200 psig.
b. 16-inch (400-mm) Diameter and Larger: 150 psig.

3. End Connections: As shown in the Drawings.

a. Standard mechanical joint ends comply with ANSI/AWWA C111.

b. Flanged end dimensions and drilling comply with ANSI/ASME B16.1, class 125, unless shown otherwise. Comply with AWWA C115 & ASME 16.5.

1) The Contractor shall coordinate with pipe, valve and fitting suppliers to make certain pipe, valve and fitting flanges match in bolt pattern.

4. Gear Actuators: Conforming to AWWA C504 for manual valves.

5. Linings and Coatings:

a. Corrosion-resistant fusion bonded epoxy conforming to AWWA C550 and NSF 61.

b. All internal and external ferrous surfaces.

c. Do not coat flange faces of valves.

6. Bubble-tight at the rated pressure for bi-directional flow.

7. Style: Wafer.

8. Shaft: Self-lubricating. One-piece, through-shaft construction.

a. Type 304 stainless steel confirming to ASTM A-276.

b. Shall be standard self-adjusting split V packing.

c. Shall be of a design allowing replacement without removing the valve shaft.

9. Seats: Mounted on body for valves 24 inches and smaller; field replaceable (mechanically retained in a machined groove) for valves larger than 24 inches.

10. Packing: Replaceable without dismantling valve.

B. Operation:

1. Open counterclockwise, unless otherwise indicated in the Drawings.

2. Operators shall be of the traveling nut, self- locking type and shall be designed to hold the valve in any intermediate position between full open and fully closed without creeping or fluttering.

3. Buried Valves: All buried valves shall be provided with 2-inch square operating nuts.

C. Materials:

1. Body: ASTM A126, cast iron or ASTM A536, ductile iron, Integrally cast flanged or mechanical end joints.

2. Shaft: Stainless steel.

3. Disc: ASTM A126, cast iron or ASTM A536, ductile iron;

4. Seats: Resilient, replaceable, Buna-N.

5. Seating Surfaces: Type 316 stainless steel.

6. Bearings:

    a. Sleeve: Corrosion-resistant and self-lubricating.

D. Manufacturers:

1. Henry Pratt Company.
2. Mueller Company.
3. Dezurik.

2.3 SOURCE QUALITY CONTROL

A. Testing: Test butterfly valves according to AWWA C504.

PART 3 EXECUTION

3.1 INSTALLATION

A. As required by Section 33 12 16, Water Utility Distribution & Transmission Valves.

B. Install according to manufacturer's instructions.

END OF SECTION

SECTION 40 05 23.72

MISCELLANEOUS VALVES

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes miscellaneous valves not included in other Sections for use in buried service and utility vaults.

B. Section Includes:

1. Air release valves.
2. Ball valves, 2 inches and under.

1.2 RELATED SECTION

A. Section 33 11 10 - Water Utility Distribution & Transmission Piping
B. Section 33 12 16 - Water Utility Distribution and Transmission Valves

1.3 REFERENCE STANDARDS

A. American Society of Mechanical Engineers:

1. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings.

2. ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through 24 - Metric/Inch Standard.

3. ASME B16.11 - Forged Fittings, Socket-Welding and Threaded.

4. ASME B16.42 - Ductile Iron Pipe Flanges and Flanged Fittings: Classes 150 and 300.

5. ASME B1.20.1 - Pipe Threads, General Purpose (Inch).

B. ASTM International:

1. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.

2. ASTM A536 - Standard Specification for Ductile Iron Castings.

3. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings.

1.4 COORDINATION

A. Contractor shall be solely responsible to coordinate Work of this Section with piping, equipment, and appurtenances.

1.5 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data:

1. Submit manufacturer's latest published literature. Include illustrations, installation and maintenance instructions, and parts lists.

2. Submit valve cavitation limits.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Manufacturer Instructions: Submit installation instructions and special requirements, including storage and handling procedures.

E. Lining and coating data.

F. Valve Labeling Schedule: Indicate valve locations and nametag text.

G. Certification of Valves Larger than 12 inches: Furnish certified copies of hydrostatic factory tests, indicating compliance with applicable standards.

H. Source Quality-Control Submittals: Indicate results of factory tests and inspections.

I. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections, including factory-applied coatings.

1.6 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of valves and actuators.

B. Operation and Maintenance Data: Submit information for valves.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Spare Parts:

1. Furnish one set of manufacturer's recommended spare parts.

B. Tools:

1. Furnish special wrenches and other devices required for Owner to maintain equipment.

2. Furnish compatible and appropriately labeled toolbox when requested by Owner.

1.8 QUALITY ASSURANCE

A. Cast manufacturer's name, pressure rating, size of valve and year of fabrication into valve body.

B. Valve Testing: Each valve body shall be tested under a test pressure equal to twice its design water-working pressure.

C. Certification: Prior to shipment, submit for all valves over 12 inches in diameter, certified, notarized copies of the hydrostatic factory tests, showing compliance with the applicable standards of AWWA, ANSI, ASTM, etc. Valves tested and supplied shall be trackable and traceable by serial number, tagged or otherwise noted on valve, upon arrival to Site.

D. Maintain clearances as indicated on Drawings.

E. Unless otherwise noted, all water works materials provided for the Project shall be new, of first-class quality and shall be made by reputable manufacturers.

F. All material of a like kind shall be provided from a single manufacturer, unless otherwise approved by the Engineer.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

B. Store materials according to manufacturer instructions.

1. Store materials in areas protected from weather, moisture, or other potential damage.

2. Do not store materials directly on ground.

C. Protection:

1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.

2. Protect valve ends from entry of foreign materials by providing temporary covers and plugs.

3. Provide additional protection according to manufacturer instructions.

D. Handle products carefully to prevent damage to interior or exterior surfaces.

E. All defective or damaged materials shall be replaced with new materials at no cost to the Owner.

PART 2 PRODUCTS

2.1 GENERAL

A. All materials in contact with potable water shall conform to ANSI/NSF Standard 61 and meet the "lead free" requirements of the Safe Drinking Water Act amendment, effective January 4, 2014, as per the lead content evaluation procedures outlined in NSF/ANSI Standard 372.1.

1. All fittings shall either be cast or permanently stamped with markings identifying the item as complying with NSF 61 per the requirements of NSF 372 for "lead free".

2. All brass in contact with potable water shall comply with ASTM B584.

2.2 AIR RELEASE VALVES

A. Description:

1. Inlet Size: 2-inch diameter and 6-inch diameter, as shown on Plans.
2. Has features of both an air release valve and an air & vacuum valve.
3. Ductile-iron body & cover for air & vacuum valve. Comply with ASTM A536, 60-40-18.
4. Orifice seat design: combination of bronze or stainless steel and E.P.D.M rubber.
5. Rolling Seal Mechanism for air release valve with ¼-inch NPT outlet.
6. Fusion bonded epoxy coating.
7. 2" diameter (nominal) air valve to be provided with inlet for NPT threaded connection and special ring gasket for sealing NPSM outlet for direct NPT threaded connection to vent piping per Plans.
8. 6" diameter valve to be provided with standard flanged inlet. Flanged vent outlet to be assembled with bolts for connecting to blind tapped holes in air & vacuum valve cover.
9. Max design working pressure: 16 Bar (approx. 232 psig.)

B. Manufacturers:

1. ARI - Series D-060-C HF, or approved equal.

2.3 BALL VALVES, 2 INCHES AND UNDER

A. Description:

1. 400 lb. WOG with bronze body and trim, unless otherwise shown on the Drawings.

2. Seat ring: TFE.

3. O-ring seals: Fluorocarbon.

4. Three-piece construction so that maintenance can be performed without distributing the valve body after installation.

B. Manufacturer:

1. Nibco T-590-Y or equal.

2.4 SOURCE QUALITY CONTROL

A. Testing Pressure-Reducing and Pressure-Sustaining Valves:

1. Leakage Testing:

a. Test each assembled valve hydrostatically at 1-1/2 times rated working pressure for minimum five minutes.

b. Test each valve for leakage at rated working pressure against closed valve.

c. Permitted Leakage: None.

2. Functional Testing:

a. Test each valve to verify specified performance.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install valves per manufacturer requirements and recommendations.

B. Install all valves with valve seats level.

END OF SECTION

SUPPLEMENTARY INFORMATION

Fact Sheet

Asbestos Information for Those Who Work with AC Water Pipe

If you work with asbestos-containing (AC) water pipe you need to be aware of several rules that may affect your ability to maintain, remove, and dispose of AC pipe. DEQ and Lane Regional Air Protection Agency (LRAPA) have specific rules regarding the handling and disposal of asbestos-containing materials (ACM). Depending on the type, amount, and condition of the ACM, you may be subject to some or all of these rules.

Asbestos fibers in the air pose a significant health threat to employees, the public, and the environment. DEQ/LRAPA regulates the removal and disposal of ACM to prevent asbestos fiber release and exposure.

In general, there are two types of ACMs:

- **Friable** ACM will easily release fibers when crushed. When AC pipe is mishandled or damaged, all rules pertaining to friable ACM apply. Only DEQ licensed asbestos abatement contractors and certified asbestos workers can remove and dispose of friable ACM. DEQ has specific training courses available that meet these certification needs. A list of DEQ licensed asbestos abatement contractors and training information can be found online http://www.deq.state.or.us/aq/asbestos/
- **Non-friable** ACM have a binder that holds the asbestos fibers within a solid matrix and will not allow asbestos fibers to release easily, unless mishandled, damaged, or in badly worn or weathered condition. AC water pipe in good condition and removed properly is considered a non-friable material.

You do not need to be a DEQ licensed asbestos abatement contractor or a certified asbestos worker to perform non-friable asbestos abatement. **However, non-friable materials must remain in non-friable condition (predominantly whole pieces) during the removal and disposal process**. If you remove non-friable AC water pipe, follow the DEQ guidance document. In addition, a non-friable project notification and fee are required to be submitted to DEQ five (5) days prior to the start date of the project. The waiting period can be waived by DEQ on a case by case basis under certain conditions. A copy of the guidance document and project notification can be obtained by contacting a regional office listed below.

Asbestos rules prohibit abandoning AC water pipe in the ground once exposed. There are special cases that allow AC water pipe to be left in the ground (i.e. AC pipe under an existing roadway or AC pipe under a building). Call DEQ to determine if your project qualifies. If AC water pipe is removed, the asbestos-containing waste material (ACWM) must be adequately wet. DEQ recommends the ACWM be packaged in leak-tight containers

The ACWM must be disposed of at a landfill authorized to handle asbestos waste and should be accompanied by a waste shipment report (ASN-4) at the time of disposal. Contact the landfill before delivering the ACWM. Landfills can be more stringent than DEQ and may only accept ACWM by appointment. A copy of the waste shipment report and the list of authorized landfills can be obtained by contacting a regional office listed below.

Maintenance and comparable activities limited to less than three (3) linear or three (3) square feet of ACM, provided the removal is part of a needed repair operation, may be exempt from certain rules. Contact a regional office for more information.

If you disturb or mishandle ACM and cause employees, the public or the environment to be potentially exposed to asbestos fibers, you can be liable for clean-up costs and enforcement action for rule violations. An enforcement action may include a civil penalty assessment.

Copies of the guidance document, abatement contractor and landfill lists, notifications and waste shipment form can be found on the DEQ web page:
http://www.deq.state.or.us/aq/asbestos/

State of Oregon
Department of Environmental Quality

Air Quality
Asbestos
811 SW 6th Avenue
Portland, OR 97204
Phone: (503) 229-5388
(800) 452-4011
Fax: (503) 229-5675
Contact: Cory-Ann Wind
www.oregon.gov/DEQ/

06-NWR-003
Last Updated: 10/31/11
By: Cory-Ann Wind

Contact information

Clackamas, Clatsop, Columbia, Multnomah, Tillamook and Washington Counties, call the Gresham office at 503-667-8414 ext. 55022.

Benton, Lincoln, Linn, Marion, Polk and Yamhill Counties, call the Salem office at 503-378-5086 or 800-349-7677.

Lane County, call the Lane Regional Air Protection Agency at 541-736-1056 ext. 222.

Jackson, Josephine and Eastern Douglas Counties, call the Medford office at 541-776-6107 or 877-823-3216.

Coos, Curry and Western Douglas Counties, call the Coos Bay office at 541-269-2721 ext. 222.

Crook, Deschutes, Harney, Hood River, Jefferson, Klamath, Lake, Sherman, and Wasco Counties, call the Bend office at 541-633-2019.

Baker, Gilliam, Grant, Malheur, Morrow, Umatilla, Union, Wallowa, and Wheeler Counties, call the Pendleton office at 541-278-4626 or 800-304-3513.

Alternative Formats

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To make these arrangements, contact DEQ Communications and Outreach in Portland at 503-229-5696 or call toll-free in Oregon at 800-452-4011; fax to 503-229-6762; or email deqinfo@deq.state.or.us.

People with hearing impairments may call 711.

Asbestos Program

How to Remove Nonfriable Asbestos Cement Water Pipe

A Guide for Meeting DEQ Rules

State of Oregon
Department of Environmental Quality

Air Quality
Asbestos
811 SW 6th Avenue
Portland, OR 97204
Phone: 503-229-5696
800-452-4011
Fax: 503-229-6762
Contact: Cory Ann Wind
www.oregon.gov/DEQ

DEQ is a leader in restoring, maintaining and enhancing the quality of Oregon's air, land and water.

Purpose

The Department of Environmental Quality (DEQ) regulates the removal, handling and disposal of asbestos-containing materials during construction, remodeling, and demolition. This document provides guidance for removing nonfriable asbestos cement (AC) water pipe.

Before you start

Contact one of the DEQ regional offices (see contact information below) for information on complying with Oregon's asbestos program regulations.

Oregon Occupational Safety and Health Administration (OR-OSHA) also has rules for working with asbestos-containing materials. Contact OR-OSHA at 503-378-3272 for current rule and policy information.

How to determine if a material contains asbestos

The only way to determine if a material contains asbestos is to take a sample and have it analyzed by an accredited laboratory.

What is asbestos cement pipe?

Asbestos cement (AC) pipe was used widely in the mid-1900's in potable water distribution systems. Since the lifetime of this product is approximately 70 years, many projects to update this infrastructure involve removal of this product. The cement acts as a binder that holds the asbestos fibers within a solid matrix. This will prevent asbestos fibers from being released easily, unless mishandled, damaged, or in badly weathered condition. In most cases, AC pipe is considered nonfriable.

Removing nonfriable AC pipe

The removal of nonfriable asbestos-containing materials in good condition is exempt from some DEQ rules. You **do not** need to be a DEQ licensed asbestos contractor or a DEQ certified asbestos worker to do nonfriable asbestos removal. If you remove AC pipe following this guide, they should remain in a nonfriable condition.

Notification

File a DEQ notification form ASN-6 for removal of nonfriable asbestos materials and pay the applicable fee. The notification must be received by the DEQ Business Office at least 5 days prior to starting the removal project.

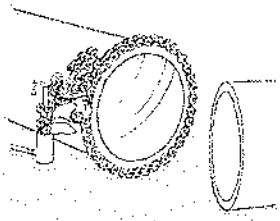
Options for removing nonfriable AC water pipe

AC water pipe must be removed, handled and disposed of in a manner that keeps the material in predominantly whole pieces to be considered nonfriable. Sanding, sawing, grinding, chipping, or the use of power tools is not allowed. The tiles must be kept wet during removal. Wetting minimizes asbestos fibers from being released.

12-AQ-007
Last updated: 1/30/12

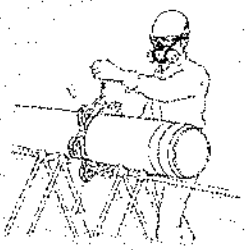
DEQ recommends that you use the following methods to remove AC pipe.

1. Snap cutters



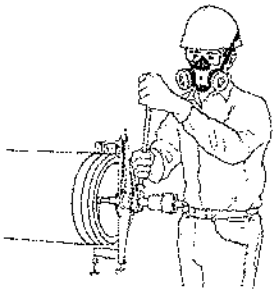
Snap cutters ("squeeze-and-pop" equipment) operate by means of cutting wheels mounted in a chain wrapper around the pipe barrel. Hydraulic pressure, applied by means of a remote, pneumatically, or manually operated pump, squeezes the cutting wheels into the pipe wall until the cut is made.

2. Carbide-tipped blade cutters



Blade cutters are frame adjustable to the circumference of the pipe and have a number of self-tracking rollers that align one or more carbide-tipped cutting blades. Because of the relatively low mechanical input and clean cutting action, hand operated blade cutters do not produce significant amounts of airborne asbestos dust.

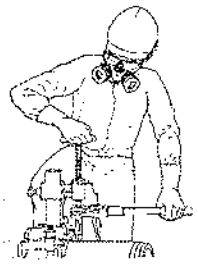
3. Manual field lathes



Manual field lathes are designed to end-trim and re-machine rough pipe barrels to factory-machined end profiles. The lathe consists of an adjustable, self-aligning arbor inserted into the pipe bore (which acts as a mandrel upon which the turning handle operates), a screw-fed turning frame, carbide machining blades, and manual (hand or ratchet) turning handles.

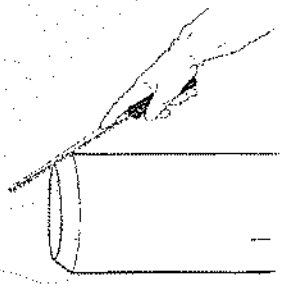
4. Wet tapping AC pressure pipe

Pressure or "wet" tapping for service connections is performed in the trench while the pipe is under pressure. The equipment (manual driven) is affixed to the pipe by means of a chain yoke. A combination boring-and-inserting bar drills and taps the pipe wall and inserts a corporation stop or pipe plug. The pressure chamber, which protects against water leakage, also catches the asbestos-cement chips, so this is essentially a dust-free operation.



5. Dry tapping ACD pressure pipe

Non-pressure or "dry" tapping for service connections may be performed in or out of the trench. The equipment is affixed to the pipe by means of a chain yoke. Separate drills and taps or a combination tool is used to drill and tap the pipe wall. Corporation stops or other connections may then be affixed to the pipe.

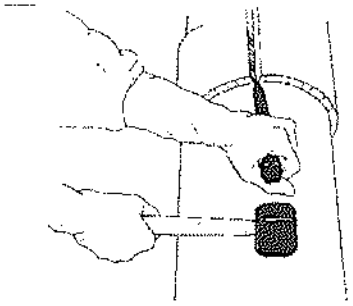


6. Manual rasp

Short lengths of AC pipe, machined-end exclusively (MEE) and machined overall (MOA), can be cut to make closures and repairs and to locate fittings exactly. Field-cut ends may be re-beveled with a coarse wood rasp to form a taper approximating the profile of the factory-beveled end.

7. Chisel and rasp

Holes may be cut into AC pipe with a hammer and chisel. The edge of a plumber's wood chisel is used to cut completely around the hole outline, about ¼ in. (7 mm) from the prescribed line. The operation is repeated and the cut deepened until through. The edges of the hole are then dressed with a coarse wood rasp.



8. Hammer and chisel

Replacement of damaged pipe may necessitate excavation, exposure and removal. AC coupling removal may be accomplished by gradually splitting the coupling lengthwise using a chisel and hammer. After the top of the coupling has been split, a crowbar or similar tool is used as a lever to split the bottom of the coupling.

Waste Disposal

Place the AC pipe in a leak-tight container and mark it with the warning statement "DANGER ASBESTOS-CONTAINING MATERIAL". Locate a landfill that is authorized to accept asbestos waste and be sure to inquire about hours of operation and any special packaging requirements they might have. Fill out a DEQ waste shipment report ASN-4 and give it to the landfill upon arrival.

If the material becomes friable

If the AC pipe becomes shattered, damaged, or is badly weathered, it is considered friable and may release asbestos fibers. If the tiles become friable, stop work immediately and promptly contact a DEQ licensed asbestos abatement contractor. Friable asbestos materials must be removed by a ***DEQ licensed asbestos contractor using DEQ certified workers.***

All asbestos abatement rules under OAR 340-248-0005 through -0280 must be followed. A DEQ notification form ASN-1 for the removal of friable asbestos and the applicable fee must be filed.

The notification must be received by the DEQ Business Office at least 10 days prior to starting the removal project. For emergency situations a waiver of the 10-day period may be granted by the DEQ. For more information contact DEQ.

For more information

Please contact the office nearest to where the project is occurring:

Clackamas, Clatsop, Columbia, Multnomah, Tillamook and Washington Counties:
Contact Susan Patterson, Gresham office at 503-667-8414 x 55022.

Benton, Lincoln, Linn, Marion, Polk and Yamhill Counties:
Contact Dottie Boyd, Salem office at 503-378-5086 or 800-349-7677.

Lane County:
Contact Tom Freeman, Lane Regional Air Protection Agency at 541-736-1056 x 222.

Jackson, Josephine and Eastern Douglas Counties:
Contact Steve Croucher, Medford office at 541-776-6107 or 877-823-3216.

Coos, Curry and Western Douglas Counties:
Contact Martin Abts, Coos Bay office at 541-269-2721, extension 222.

Crook, Deschutes, Harney, Hood River, Jefferson, Klamath, Lake, Sherman, and Wasco Counties:
Contact Frank Messina, Bend office at 541-633-2019.

Baker, Gilliam, Grant, Malheur, Morrow, Umatilla, Union, Wallowa, and Wheeler Counties:
Contact Tom Hack, Pendleton office at 541-278-4626 or 800-304-3513.

Accessibility information

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To make these arrangements, contact DEQ Communications and Outreach in Portland at 503-229-5696 or call toll-free in Oregon at 800-452-4011; fax 503-229-6762; email: deqinfo@deq.state.or.us.

People with hearing impairments may call 711.

Print Form

ASN 6

DEQ NOTIFICATION FORM

For Nonfriable Asbestos Removal

For DEQ use only
Date Received:
Amount Received:
Check Number:
Project Number:

ATTENTION!

CONTRACTORS: This notification is not complete unless it is accompanied by the required $100.00 fee and is submitted 5 days prior to the start date. All notifications where the 5-day period has been waived are subject to a fee increase of 50%. To inquire about a waiver of the 5-day notification period or for other information call 1-800-452-4011 for the phone number of your local regional DEQ office.

♦♦♦(PLEASE TYPE OR PRINT CLEARLY)♦♦♦

Is this a revision to a previous notification? Yes ○ No ○ If Yes, enter Revision #

Start date of project: End date of project:

Days of week and hours to be worked:

Project site name: Building Owner:

Project address:
(Include Apt #, Floor #, Bldg #, school name or any other pertinent site location information)

City: County: State: OR Zip:

Was a survey performed: Yes: ○ No: ○ By whom?

Type of non-friable material to be removed:

Amount of non-friable asbestos material to be removed. Square footage:

Contractor name: Phone:

Contractor address:

City: County: State Zip:

CCB registration number: Competent Person:

Waste disposal site:

Site address:

City: County: State: Zip:

Waste hauler: Phone:

Sign below and send this form with the appropriate fee to The DEQ Business Office at 811 SW 6th Ave., Portland, Oregon 97204. Make checks payable to "DEQ"

Name of owner, operator or contractor:

Name: Phone:

(PLEASE PRINT)

Signature: _____ Date:

CAUTION! If the material being removed is handled in a manner that causes it to become friable (shattered, pulverized, or reduced to dust), then only a DEQ licensed asbestos abatement contractor may perform the removal work. Submit nonfriable notifications and fees in accordance with OAR 340-248-0260. Revisions to notifications may be **faxed** to Gresham NWR at (503) 674-5148, Bend ER at (541) 388-8283, Salem WR at (503) 378-4196, or Medford WR at (541) 776-6262.

Print Form

ASN 4 ASBESTOS WASTE SHIPMENT REPORT FORM

PLEASE PRINT OR TYPE! If you have questions, contact your local DEQ Regional Office in Gresham at (503) 667-8414 x 55018, Salem at (503) 378-5086, Medford at (541) 776-6010 ext. 235, or Bend at (541) 388-6146 ext. 226, Pendleton (541) 278-4626, **OR** call (800) 452-4011 for the location of your local regional DEQ office.

WASTE GENERATOR: (Contractor, Facility, or Operator)

1. Asbestos removal site name and address:

Street | City/State | County | Zip

Contact person: Phone:

2. Operator's name and address: Phone:

Street | City/State | County | Zip

3. Waste disposal site: Phone:

Street | City/State | County | Zip

4. Describe asbestos materials:

5. Containers: Number: Type:

6. Total quantity (cubic yards):

7. **OPERATOR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packaged, marked and labeled, and are in all respects in proper condition for transport according to all government regulations. All movement of this asbestos-containing material is recorded on this Waste Shipment Record Form.

Name: Company:

Signature: _____ Date:

TRANSPORTER(S):

8. Transporter #1: (Acknowledgment of receipt of materials)

Agent: Company:

Address: Phone:

Signature: _____ Date:

9. Transporter #2: (Acknowledgment of receipt of materials)

Agent: Company:

Address: Phone:

Signature: _____ Date:

DISPOSAL: (Certification of receipt of asbestos materials covered by this manifest, except as noted in item 11 below.)

10. Waste Disposal Site:

Name and Title: Date:

Signature: _____ Phone:

11. **DISCREPANCY SPACE:** (Add attachments as needed)

(Revised 12/07)

OREGON LANDFILLS ACCEPTING ASBESTOS WASTES

The following is a list of landfills authorized by the Oregon DEQ to accept asbestos wastes. OAR 340-248-0280(6) requires that you notify the landfill prior to disposal. DEQ suggests you contact the landfill at least a 24 hours before disposal in order to allow the landfill operator time to prepare a site for burial.

LANDFILL NAME	COUNTY	ADDRESS/PHONE
	NORTHWEST REGION	
Hillsboro Landfill	Washington	Waste Management Inc. 3250 SE Minter Bridge Road Hillsboro, OR 97123 (503) 640-9427
	LANE COUNTY	
Short Mountain Landfill	Lane	Lane Co. Public Service Division 125 East 8th Avenue Eugene, OR 97401 (541) 746-6228
	WESTERN REGION	
Brown's Island Landfill	Marion	2895 Faragate St., S. Salem, OR 97306 (503) 588-5064
Coffin Butte Landfill	Benton	Valley Landfills, Inc. 28972 Coffin Butte Road Corvallis, OR 97330 (541) 745-2018
Dry Creek Landfill	Jackson	Rogue Disposal Service, Inc. 135 West Main Medford, OR 97501 (541) 826-4949
Roseburg Landfill	Douglas	Dept. of Public Works 1036 SE Douglas Roseburg, OR 97470 (541) 440-4271

LANDFILL NAME	COUNTY	ADDRESS/PHONE
	EASTERN REGION	
Crook County Landfill	Crook	Prineville Disposal Inc. PO Box J Prineville, OR 97754 (541) 447-5208
Knott Pit Landfill	Deschutes	Dept. of Public Works 61150 SE 27th Street Bend, OR 97702 (541) 388-6581
Klamath Falls Landfill	Klamath	Dept. of Solid Waste Mgmt. 343 Main Street Klamath Falls, OR 97601 (541) 883-4696
Northern Wasco County Landfill	WASCO	2550 Steele Road The Dalles, OR 97058 (541) 296-4082
Chemical Waste Management of the Northwest Landfill	Gilliam	Hazardous Waste Landfill 17629 Cedar Springs Lane Arlington, OR 97812 (541) 454-3218
Baker City Landfill	Baker	Baker Valley Enterprises PO box 169 Baker City, OR 97814 (541) 523-2626
Columbia Ridge Landfill & Recycling	Gilliam	Waste Management Inc. Star Route, Box 6 Arlington, OR 97812 (541) 454-2030
Finley Butte Landfill	Morrow	PO Box 350 Boardman, OR 97818 (541) 481-2233
Fox Hill Landfill	Union	Grande-Ronde Recovery, Inc. 1202 Willow La Grande, OR 97850 (541) 963-5459

Foundation Engineering, Inc.
Professional Geotechnical Services

Memorandum

Date:	March 13, 2020
To:	Justin Luce, P.E. Murraysmith
From:	Brooke Running, R.G., C.E.G. James Maitland, P.E.
Subject:	Phase 2 Geotechnical Investigation
Project:	West Avenue Water Main Extension Project No.: 2181121

We have completed the requested Phase 2 geotechnical investigation for the above-referenced project. Our report includes a description of our work, a discussion of the site conditions, exploration logs, a summary of the field and laboratory testing, and a discussion of subsurface conditions along the selected alignment, Route A. Key geotechnical issues pertaining to the selected water main alignment are also discussed.

BACKGROUND

The City of Roseburg plans to construct a new water main extending from West Avenue to Reservoir No. 7. The site location is shown on Figure 1A (Appendix A). There were three alignment route options being considered, designated as Routes A, B, and C.

The preferred alignment, Route A, was selected and the site layout, alignment, and explorations are shown on Figure 2A (Appendix A). We understand the diameter of the water main will be 24 inches and depths of the main will range from ±6.5 to 15 feet.

The City of Roseburg is the project owner. Murraysmith is the prime civil designer. Foundation Engineering, Inc. was retained by Murraysmith as the geotechnical consultant. Our scope of work was summarized in a proposal dated November 1, 2018, and authorized by Task Order 18-2368.

SCOPE OF WORK

The geotechnical work was completed in two phases. Phase 1 preliminary work included a literature review of local subsurface information and a field reconnaissance of the alignment alternatives. Results of that work were summarized in a technical memorandum dated September 4, 2019, and were used in the alignment selection process. Phase 2 included exploratory drilling and test pits along the selected alignment (Route A, also referred to herein as the selected alignment), field and laboratory testing, and preparation of this report.

LITERATURE SEARCH

The Phase 1 work included a review of available geologic and seismic publications and maps to characterize the local geology, provide a preliminary evaluation of the subsurface conditions, and identify potential seismic hazards. Oregon Department of Geology and Mineral Industries (DOGAMI) provides online hazard information through online HazVu, LiDAR, and SLIDO viewers where we reviewed the landslide hazard mapping, existing landslide inventory, and LiDAR images (DOGAMI, 2016, 2017, 2018). We also reviewed local water well logs available from the Oregon Water Resources Department (OWRD) website and information from other geotechnical investigations previously completed by Foundation Engineering in the project vicinity. We also reviewed the Geotechnical Studies report for the Roseburg Water Storage Reservoir (Reservoir No. 7) dated September 12, 1979, by Willamette Geotechnical, Inc.

FIELD RECONNAISSANCE

Brooke Running, C.E.G. completed the site reconnaissance on June 13, 2019, accompanied by Daryn Anderson, P.E. (City of Roseburg). Mr. Anderson provided an overview of the project, a general site history, and a tour of access points for the different routes and the existing reservoir.

All of the proposed routes cross property owned by the Cow Creek Tribe and right-of-entry was limited along portions of Routes B and C. The reconnaissance included traversing the proposed alignments and observing and photographing the surface features to record variations in the local geology and topography. During the site visit, we noted surface conditions, grade changes, existing cut and fill slopes, potential utility conflicts, and other features that could impact water main exploration and construction.

LOCAL GEOLOGY

The project site is located in central Roseburg, north of the South Umpqua River. Local geologic mapping indicates the project site is underlain by basalt bedrock and interbedded sedimentary rocks of the Siletz River Volcanics, Roseburg member (Wells et al., 2000). The siltstone and sandstone sedimentary rock represents turbidite sequences interbedded with volcanics consisting of pillow basalt, breccia, and submarine basalt flows. These rock types were encountered in our explorations. Therefore, the site subsurface conditions are consistent with the mapped local geology.

PRELIMINARY (PHASE 1) STUDY

Three potential alignments (designated Routes A, B, and C) were considered at the outset of the project. Foundation Engineering completed a preliminary reconnaissance of the three alignments and summarized our findings in a technical memorandum dated September 4, 2019. That memorandum describes the three alignments and discusses the surface conditions and anticipated subsurface conditions along them. For the sake of brevity, that description is not repeated herein. Rather, we have focused on the selected Route A alignment based on the 50% Preliminary Design plan/profile drawings provided by Murraysmith, dated October of 2019, shown on Figures 3A to 5A (Appendix A).

The profile drawings for the selected alignment indicate the typical trenching depths will vary between ±6.5 and 15 feet, and concrete slope anchors, as required from Sta. A6+45 to A7+09, Sta. A7+38 to Sta. A7+66 and from Sta. A13+17 to A15+30.

SURFACE CONDITIONS ALONG THE SELECTED ALIGNMENT

The selected alignment follows West Avenue to Alder Street along the initial east-west segment from Sta. A1+00 to 5+00. This segment extends through a predominantly residential neighborhood with several commercial buildings. Low traffic volume was observed along this segment during our site reconnaissance and exploration.

Numerous underground and overhead utilities are located within this segment. These consist of water, sanitary sewer drains, and natural gas. The underground utilities are within the roadway and within the right-of-way. Overhead power is located along the north shoulder of West Avenue.

The remainder of the alignment is located within private property and we understand the only utility present is the City of Roseburg's existing water main and connection to Reservoir No. 7.

FIELD EXPLORATION

Borings

Four boreholes (BH-1 to BH-4) were drilled along Route A on January 13 and 14, 2020. The boreholes were drilled by Western States Soil Conservation, Inc. using a GeoProbe 7822DT track-mounted rig with mud-rotary drilling techniques. The boreholes were drilled to depths of ±16 to 18 feet.

Samples were typically obtained at 2.5-foot intervals to the maximum depth of the borings. Disturbed samples were obtained with a split-spoon sampler. The Standard Penetration Test (SPT), which is run when the split-spoon is driven, provides an indication of the relative stiffness or density of the soils and rock hardness. No rock coring was completed due to the fractured nature of the bedrock.

The soil and rock profiles observed in the borings were continuously logged during drilling. The final logs (Appendix B) were prepared based on a review of the field logs, an examination of the soil and rock samples in our office, and the laboratory test results. The approximate boring locations are shown on Figure 2A through 5A (Appendix A).

Test Pits

Four exploratory test pits (TP-1 through TP-4) were excavated at the site on January 15, 2020, using a CASE CX210D tracked excavator. The test pits extended to maximum depths ranging from ±7 to 13 feet below the existing ground surface. The subsurface profiles were logged, and soil samples were obtained for possible laboratory testing and observation in our office.

SUBSURFACE CONDITIONS

Subsurface conditions encountered in the borings and test pits are discussed in order along the alignment. More detailed information is available in the appended logs. The explorations locations were selected in consultation with Murraysmith to provide an overview of the subsurface conditions. However, the number of borings and test pits was limited by available budget, and the exploration locations were predicated on available access and utility or other conflicts. Therefore, interpolation of the subsurface information from widely spaced explorations was required.

Surface elevations for the explorations and design invert depths were estimated from the 50% Preliminary Design plan/profile sheets prepared by Murraysmith and should be considered approximate. Based on the Route A profile, we estimated the pipe invert will extend to ±6.5 to 15 feet. The soil or rock conditions anticipated at the estimated invert elevations are discussed below. However, we understand minor changes in the invert elevations may occur as the design progresses.

BH-1 (±Sta. A2+18)

BH-1 was drilled along the north shoulder of West Avenue, ±40 feet west of Post Street. The surface elevation at BH-1 was estimated to be ±El. 486.5.

The pavement section at BH-1 consisted of ±2 to 4 inches of asphalt concrete (AC) followed by dense crushed rock (base rock) to ±12 inches. The pavement section is underlain by soft, medium to high plasticity clay (possible fill/colluvium) to ±5.1 feet. The clay is underlain by stiff becoming medium stiff silt with some fine to medium sand (residual soil) to ±14.5 feet. Dark brown, extremely weak to very weak (R0 to R1), moderately to slightly weathered sandstone of the Siletz River Volcanics – Roseburg member was encountered below the residual soil and extends to the maximum depth of the exploration (±15.9 feet).

The surface of the sandstone bedrock was encountered at a depth of ±14.5 feet (±El. 472), and the proposed pipe invert is at a depth of ±9.5 feet (±El. 477). Therefore, most of the pipe in the vicinity of BH-1 is expected to be bedded in stiff silt with some fine to medium sand (residual soil).

BH-2 (±Sta. A4+92)

BH-2 was drilled along the south shoulder of West Avenue. We estimated the ground surface at BH-2 to be ±El. 513.0.

The pavement section at BH-2 consisted of ±3 to 4 inches of AC followed by loose gravel (fill) to ±3 feet. Some drilling fluid loss was encountered within the upper ±2 feet of the fill. The fill is underlain by possible fill consisting of stiff silt with some fine to coarse sand to ±5 feet. Dark grey-brown and iron-stained, highly weathered, extremely weak grading to very weak (R0 to R1) basalt of the Siletz River Volcanics – Roseburg member was encountered at ±5 feet (±El. 508) and extends to ±16.5 feet, the limits of the exploration. The basalt was easily drilled using a spade bit.

The planned pipe invert at BH-2 is ±13 feet below the ground surface (±El. 500). Based on the soil profile at BH-2, we anticipate the pipe in the vicinity of this boring will be bedded in R0 to R1 basalt.

TP-1 (±Sta. A6+34)

TP-1 was excavated at the east end of the private driveway. We estimated the ground surface at TP-1 lies at ±El. 534.

Approximately 1.4 feet of fill consisting of medium stiff clayey silt with some gravel was encountered at TP-1. Basalt of the Siletz River Volcanics – Roseburg member extends below the fill to the maximum depth of the exploration (±7 feet) where the CASE CX210D excavator encountered practical digging refusal. Digging into the basalt initially was fairly easy due to the very close to close jointing of the rock. However, the jointing became close below ±4 feet and the basalt became medium strong (R3) below ±6 feet. No seepage was encountered to the limit of the exploration.

The planned pipe invert at TP-1 is ±7.5 feet below the ground surface (±El. 526.5). Therefore, the pipe in the vicinity of TP-1 is expected to be bedded in predominantly R3 basalt.

TP-2 (±Sta. A7+71)

We estimated the ground surface at TP-2 lies at ±El. 579.5.

Approximately 3.5 feet of medium stiff to stiff, gravelly clayey silt with some sand (possible fill) was encountered in TP-2. Stiff to very stiff, high plasticity, gravelly clay (residual soil) extends from ±3.5 feet to the maximum depth of the exploration (±13 feet). Digging was very easy with the CASE CX210D excavator to ±13 feet. The test pit side walls collapsed from ±3 to 11 feet, and the excavation was terminated shortly thereafter due to caving. No seepage was encountered to the limit of the exploration.

We estimated the pipe invert is ±7.5 feet below the ground surface (±El. 572) near TP-2. Therefore, the pipe is expected to be bedded in predominantly stiff to very stiff gravelly clay (residual soil). Trench wall instability should also be expected in this area.

TP-3 (±Sta. A9+70)

We estimated the ground surface at TP-3 lies at ±El. 559.5.

Approximately 1.5 feet of soft to medium stiff clayey silt with some sand and gravel (fill) was encountered in TP-3. Stiff, medium to high plasticity clayey silt (possible colluvium/residual soil) extends below the fill to ±3.5 feet. Very stiff to hard, high plasticity clay with some silt (residual soil) extends below the clayey silt to ±8.5 feet (±El. 551.0). Digging was relatively easy with the CASE CX210D excavator to ±4 feet. Below 3.5 feet the residual soil was damp and below 4 feet digging became more difficult.

Very weak (R1) siltstone with occasional thin sandstone interbeds extends to the maximum depth of the exploration (±13 feet). Relict rock texture was observed below ±6 feet where the digging below became more difficult. Very slow seepage was encountered at ±3.5 feet (±El. 556.0).

We estimated the pipe invert at TP-3 is ±13 feet below the ground surface (±El. 546.5) near TP-3. Therefore, in this area, the pipe is expected to be bedded at or near the transition from very stiff to hard clay with some silt (residual soil) to R1 siltstone.

BH-3 (±Sta. A11+18)

We estimated the ground surface at BH-3 lies at ±El. 577.5.

Soft grading to stiff, high plasticity clay (colluvium) was encountered from the ground surface to ±7 feet. Stiff, medium plasticity clay with some fine to medium sand (residual soil) extended below the colluvium to ±13 feet (±El.564.5). Extremely weak to very weak (R0 to R1), brown and iron-stained, highly weathered siltstone extends below the residual soil to (±18.3 feet), the limit of the exploration. Harder drilling and very weak and moderately weathered (R1) siltstone (Siletz River Volcanics – Roseburg member) were encountered below ±17.5 feet.

We estimated the pipe invert at BH-3 will extend ±9.5 feet below the ground surface (±El. 568). Therefore, the pipe in this area is expected to be bedded in predominantly stiff clay with some sand (residual soil). Due to the plasticity of the colluvium and residual soil, there is a moderate risk of trench wall instability in this area.

TP-4 (±Sta. A12+90)

We estimated the ground surface at TP-4 lies at ±El. 611.5.

Soft to medium stiff, medium plasticity clayey silt with some gravel extended below the ground surface to a depth of ±1.6 feet. A thin layer of residual soil (±5 inches) consisting of medium stiff silt with some fine to coarse sand extended to ±2.0 feet, where basalt was encountered. From ±2 to 3.5 feet, the basalt is extremely weak (R0), dark grey-brown and iron-stained, highly weathered with very close joints that are silt-infilled and iron and manganese-stained. Below ±3.5 feet, the basalt becomes very weak (R1) with very close to close joints that are iron and manganese-stained. Very slow seepage was encountered at ±3.5 feet (±El. 608.0).

Excavation with the CASE CX210D was relatively easy to ±4.5 feet and the operator was able to continue digging to ±11 feet. Below ±11 feet, digging became more difficult in the basalt. In addition, the excavation was hampered by the steepness of the terrain and the wet, slippery surface of the slope. The excavator operator indicated he could continue digging into the basalt but would need to do additional slope benching. However, excavation was discontinued at ±13 feet to avoid further slope disturbance.

We estimated the pipe invert at TP-4 will extend ±7 feet below the ground surface (±El. 604.5). Therefore, the pipe is expected to be bedded in predominantly very weak (R1), moderately weathered basalt. Trenching during wet weather or wet surface conditions will be significantly more difficult on the steep slope.

BH-4 (±Sta. A15+31)

BH-4 was drilled inside the fence at the City of Roseburg's reservoir facility. The borehole was located ±58 feet north-northeast of the existing valve for the 36-inch reservoir inlet/outlet. We estimated the ground surface at BH-4 lies at ±El. 692.0.

Dense to very dense sandy gravel with some silt (fill) extends below the ground surface to a depth of ±3.2 feet. Extremely weak to very weak (R0 to R1) basalt of the Siletz River Volcanics – Roseburg member extends below the fill to (±17.8 feet), the limits of exploration. The basalt is dark grey-brown and highly to moderately weathered with very close joints. The basalt is iron-stained from ±3.2 to 7.5 feet and was easily drilled using a spade bit.

Previous explorations for Reservoir No. 7 reported encountering basalt or sandstone at ±2 feet below the original ground surface. TP-5 from the Willamette Geotechnical, Inc. report (1979) is the closest exploration to BH-4. The test pit log indicates brown to black, stiff, plastic clay extending to ±2 feet. The clay is followed by dense, weathered basalt. The previous subsurface conditions are similar to those encountered in BH-4.

We estimated the pipe invert at BH-4 will extend ±8 feet below the ground surface (±El. 684.0). Therefore, the pipe is expected to be bedded in extremely weak to very weak (R0 to R1), highly to moderately weathered basalt.

Ground Water

Mud-rotary drilling methods were used to advance the borings which precluded ground water observations at the time of drilling. However, during excavation of the test pits, seepage was observed and noted. Seepage elevations observed in the test pits are summarized in Table 1. We anticipate the ground water level will fluctuate seasonally and may rise above invert elevations during the winter and spring months.

Subsurface Conditions Summary

A summary of elevations of key strata and anticipated conditions at the pipe invert is provided in Table 1.

Table 1. Summary of Anticipated Subsurface Conditions

Exploration	Surface Elevation (feet)	Bedrock Elevation (feet)	Approximate Invert Elevation (feet)	Anticipated Material at Invert Elevation	Observed Seepage Elevation (feet)
BH-1	486.5	472.0	477.0	Stiff SILT, some sand	N/A
BH-2	513.0	508.0	500.0	R0 to R1 BASALT	N/A
TP-1	534.0	532.6	526.5	R3 BASALT	None
TP-2	579.5	N/A	572.0	Stiff to very stiff gravelly CLAY	None
TP-3	559.5	551.0	546.5	Very stiff to hard CLAY, some silt, to R1 SILTSTONE	556.0
BH-3	577.5	564.5	568.0	Stiff CLAY, some sand	N/A
TP-4	611.5	609.5	604.5	R1 BASALT	608.0
BH-4	692.0	688.8	684.0	R0 to R1 BASALT	N/A

Notes:
1. All elevations are approximate only.
2. N/A = not applicable due to mud-rotary drilling techniques.
3. None = No seepage or ground water was encountered to the limit of the exploration.

It should be noted the soil and bedrock conditions vary significantly between test pits and borings. Therefore, subsurface conditions at interim locations will require interpolation between explorations.

LABORATORY AND FIELD TESTING

The laboratory work included natural water contents and Atterberg limits tests to classify the foundation soils according to the Unified Soil Classification System (USCS), determine their homogeneity, and estimate their overall engineering properties. The bedrock was not coreable; therefore, no unconfined compression tests were run. Results of the water contents and Atterberg limits tests are summarized in Table 1C (Appendix C).

We completed in-situ resistivity testing at three selected locations on January 14, 2020, using a Nilsson 400, 4-pin, soil resistance meter (ASTM G57). The test locations are shown on Figures 2A through 5A. The 4-pin resistance meter provides an estimate of the average resistivity of a soil profile extending to a depth equal to the spacing between the pins. The tests were performed with the pins spaced to bracket the estimated invert depth. The resistivity values are summarized in Table 2C (Appendix C).

Laboratory pH testing (ASTM G51) was completed on samples obtained in TP-1, TP-3 and TP-4 on samples obtained at depths close to the estimated pipe invert. The results of samples tested indicate a soil pH range of 6.0 to 6.5. The pH test results are summarized in Table 3C (Appendix C).

DISCUSSION OF KEY GEOTECHNICAL ISSUES

The following sections provide a discussion of geotechnical issues associated with water line construction. Contractors bidding on the project should be provided a copy of this report and should be familiar with the exploration logs, the discussion of subsurface conditions, and the limitations of this information. Soil specimens will be available for inspection by contractors at Foundation Engineering's office prior to bidding. Contractors should also make their own site inspection to familiarize themselves with existing utilities, roads, access, conflicts, slopes, etc.

The subsurface conditions are known only at the widely-spaced exploration locations, and the elevation of the water line invert and associated trenching depth vary along the selected alignment. Therefore, variability of the soil and rock conditions and in the depths/elevations between soil and rock units should be anticipated along the alignment.

Rock Excavation

Bedrock was encountered in most exploratory test pits and borings. The bedrock varies from siltstone to basalt and the rock surface occurs at varying depths (see appended logs).

The siltstone could be trenched in the test pits using a Case CX210D excavator. We anticipate siltstone with a rock hardness designation of RO to R1 to be diggable with a medium size excavator. The Case CX210D excavator was able to excavate the RO to R1 (extremely weak to very weak) basalt and where the rock was closely jointed or highly fractured. In general, we anticipate a medium to large size excavator can dig the basalt where it is highly fractured, have close jointing and has a rock hardness designation of R0 to R1. The Case CX210D excavator experienced practical digging refusal at TP-1 at a depth of ±7 feet. At BH-4, the basalt surface is shallow (±3 feet) and the rock hardness typically increases with depth from R0 to R2. At this location, there is a potential for hard rock conditions. We also anticipate that where the basalt hardness is R2 or greater, additional measures such has pre-splitting or fracturing with a hydraulic ram may be required for rock removal.

It is difficult to predict if and where such rock will be encountered along the pipeline alignment because there are significant changes in the terrain and trenching depths will vary. We recommend contractors assume that at locations where R2 basalt will be encountered will require supplement rock removal methods. For bidding purpose, we recommend including a unit cost for rock removal and defining material that cannot be excavated with a specific sized excavator (e.g., a Case CX225) as rock excavation. All other excavation would be considered common excavation.

Anticipated Subsurface Conditions

Sta. A1+00 to A3+90

Approximate pipe invert depths range from ±7 to 13 feet within this initial segment along West Avenue. Subsurface conditions indicate the trenching for the water main should encounter the pavement section followed by soft to stiff, fine-grained soils. R0 to R1, moderately to slightly weathered sandstone was encountered in BH-1 at a depth of 14.5 feet.

Excavation is not expected to be difficult until bedrock is encountered. Excavation in the interbedded sandstone/siltstone and/or basalt is expected to be significantly more difficult than the overlying fine-grained materials. Due to the varying subsurface conditions, shoring and dewatering of the excavations will be necessary.

Sta. A3+90 to A5+20

Approximate pipe invert depths range from ±8 to 15 feet within this segment along West Main. Within this segment, the elevation of the alignment begins to gradually rise. Subsurface conditions indicate the trenching for the water main should encounter the pavement section, followed by loose gravel fill and stiff silt with some sand. Some drilling fluid loss was encountered within the loose gravel, and possible caving should be expected in the fill, especially if seepage is encountered.

R0 to R1 basalt was encountered at ±5 feet in BH-2. Excavation is not expected to be difficult until bedrock is encountered. Excavation in the basalt is expected to be significantly more difficult than the overlying fine-grained or loose materials. Due to the varying subsurface conditions, shoring and dewatering of the excavations will be necessary.

Sta. A5+20 to A7+09

This segment extends east of West Avenue up a steep sloped driveway and steep, rock-surfaced slopes. The ground surface at the top of the sloped driveway appears to be significantly altered with the overburden removed to the east of the existing water line exposing more competent bedrock. Approximate pipe invert depths range from ±7 to 11 feet within this segment.

Subsurface conditions encountered in the explorations indicate the trenching for the water main should encounter clayey silt with some gravel (fill) followed by shallow basalt. R2 basalt was encountered at ±1.4 feet and R3 basalt below ±6 feet.

Bedrock exposed in the steep slopes between Sta.6+45 and 7+09 consists of predominantly R2 to R3 basalt. Excavation in the basalt is expected to be significantly more difficult than the overlying fill materials. Although the bedrock can be dug with relatively steep or near vertical slopes, the trenching may generate cobble-size rock fragments.

Sta. A7+09 to A10+08

This segment continues along a short bench, then continues upslope before going down a long, gradual slope. The initial bench and steeper slope in this area are heavily vegetated and difficult to access. Approximate pipe invert depths range from ±6.5 to 8 feet within this segment.

As indicated in Figure 4A, several options are being considered at Sta. A1+16. We recommend avoiding the steep terrain and follow the Option A alignment, along which the terrain's slope is more gradual.

Subsurface conditions indicate the trenching for the water main should encounter predominantly gravelly fine-grained soils (fill or residual soil). No bedrock was encountered in TP-2. R1 siltstone was encountered in TP-3 at ±8.5 feet. Excavation in the siltstone/sandstone and/or basalt is expected to be significantly more difficult than the overlying fill materials. No seepage was encountered along this segment during our exploration, although infiltration may occur in rock seams during periods of heavy rainfall. Side wall caving was observed in TP-2 from ±3 to 11 feet. Therefore, flattened slopes and shoring will be needed in this segment.

Sta. A10+08 to A11+90

This segment of the proposed water line continues upslope. Approximate pipe invert depths range from ±7 to 9 feet within this segment. Subsurface conditions indicate the trenching for the water main should encounter predominantly high plasticity clay (colluvium) followed by stiff, medium plasticity clay with some sand (residual soil).

R0 to R1 siltstone was encountered in BH-3 at ±13 feet, below the invert elevations. Excavation along this segment is estimated to occur primarily within the surficial, fine-grained soils. However, it is possible that the bedrock surface varies and could be shallower. There is a relatively high risk of trench wall instability when digging into the plastic soils. Therefore, contractors should anticipate shoring will be required to protect works. Dewatering may be required, but the plastic soils typically limit the infiltration rate.

Sta. A11+90 to A15+89

This segment continues up slope to Reservoir No. 7 along steep terrain. Approximate pipe invert depths range from ±7 to 10 feet within this segment. Subsurface conditions indicate the trenching for the water main should encounter soft to medium stiff clayey silt with some gravel followed by a thin layer of medium stiff silt with some sand (residual soil).

R0 to R2 basalt was encountered in TP-4 at ±2 feet. Excavation along this segment is expected to occur primarily in fine-grained soils and highly weathered to moderately weathered basalt. However, it is possible that the bedrock surface varies and could be shallower or deeper. Due to the varying subsurface conditions, shoring and dewatering of the excavations will be necessary. Attempts to construct this segment of the water line during wet weather will encounter difficult slope and surface conditions and is not recommended.

Seepage and Dewatering

Seepage levels observed during our field explorations are summarized in Table 1. We anticipate ground water levels will vary seasonally, with higher water levels in the winter and spring and lower levels in the summer. It should also be assumed that perched water can develop above any fine-grained soil (fill or alluvium) during the wet winter and spring. Perched water may also be present in the base rock in the early summer. Contractors should anticipate the need for trench dewatering. However, construction during dry summer and early fall months should reduce the amount of potential infiltration.

Trench Wall Stability and Shoring

Water main trenching is expected to encounter a large range of subsurface conditions including fine-grained soils (silts and clays), fill, residual soils, and bedrock (basalt, siltstone, and sandstone). Bedrock is expected at the bottom of some portions of the alignment, as discussed above. Potential caving of trench sidewalls should be expected throughout the alignment. The risk of trench wall instability is significantly higher if seepage develops in the granular soils. Contractors should plan to provide shoring to protect workers from sloughing or caving sidewalls along the entire alignment.

Excavations are anticipated to encounter predominantly medium stiff to hard, fine-grained soils. These soils correspond to an OR OSHA Soil Type B. For Type B soil, OSHA recommends a maximum temporary cut slope of 1:1 (H:V) for trenches less than 20 feet deep. The soils may degrade to a Soil Type C during wet weather or in the presence of seepage. OR OSHA recommends a maximum temporary cut slope of 1½:1 (H:V) for Type C soil. In areas of plastic clay, contractors should not count on the relatively high strength of the soil to estimate trench stability. Caving of the test pit side walls during the field exploration indicates the high risk of trench instability in this material and the need for shoring.

Basalt, siltstone, and sandstone may be encountered in the trenches along the alignment. The basalt is R0 to R3, typically highly weathered to slightly weathered, and very close to close jointed. The siltstone is R0 to R1, highly weathered to slightly weathered, and very close jointed. The sandstone is R0 to R1 and moderately to slightly weathered. The rock may tend to fracture into gravel to cobble-sized fragments when excavated. Therefore, we anticipate the basalt will not satisfy the OR OSHA requirements for competent bedrock. Suitable cut slopes in this material will need to be confirmed at the time of construction. The basalt rock fragments will also be susceptible to sloughing. Therefore, we recommend the contractors assume shoring will be required to protect workers from spalling or falling rock fragments.

Sidewall instability may extend to and undermine curbs, sidewalks, or driveways. Some damage may be unavoidable, depending on the trench setback from settlement-sensitive improvements. Therefore, shoring in the vicinity of settlement-sensitive structures should be in constant intimate contact with the excavation sidewalls during excavation and backfilling. If excavating more than 4 feet, shoring is needed. Shoring may also be required to prevent undermining existing underground utilities.

The means and methods for shoring are solely the responsibility of the contractor and should be designed by a qualified engineer. Contractors should adjust their shoring design, as needed, based on the actual soil and ground water conditions encountered in the field.

Pipe Bedding and Bottom Stabilization

All disturbed, loose soil should be removed from the bottom of the trench prior to backfilling. We recommend providing a leveling course of at least 6 inches of compacted, 1 or ¾-inch minus, well-graded, clean crushed rock or crushed gravel beneath the water line. In our explorations, we did not encounter soft ground conditions that would require trench bottom stabilization. However, the trench bottom could soften if exposed to runoff or ground water infiltration. If the bottom of the excavation becomes unstable due to dewatering, excessive ground water, or abundant fines in the gravel, the contractor may need to use 3-inch minus, open-graded, clean, crushed rock for bottom stabilization.

Stability of Existing Slopes

The segment of proposed water line immediately downhill from the reservoir consists of steep terrain. That area is underlain by bedrock within ±2 to 4 feet of the ground surface (see TP-4 and BH-4). We noted no signs of slope instability within this area and slope issues are likely to be confined to surface erosion of disturbed material. In addition, an older water line was installed, and has successfully operated, along this same segment of the alignment. However, in the vicinity of Sta. A7+16 to A7+71, we recommend avoiding the steeper terrain because shallow bedrock is absent.

Re-use of Excavated Materials as Backfill

The trenching along the water line alignment will generate spoils that will typically include fine-grained soils, plastic clay, and rock fragments. Native materials can generally be used a trench backfill outside of roadways or developed areas. We understand contractors have successfully used plastic clay as trench backfill on local projects on slopes of Reservoir Hill. However, it should be understood plastic clay (i.e., soils that have a USCS designation of CH) can develop clods that, when dried, are difficult to place and compact in narrow trenches, leading to possible trench surface settlement.

In designated wetland areas, the upper 12 inches of soil can be re-used to cap the trench backfill.

Concrete Slope Anchors

The preliminary drawings show the segment of water line on the steep terrain (between ±Sta. 13+00 and Sta. 15+20) will have concrete slope anchors on 25-foot centers. We believe a spacing of ±25 to 30 feet is appropriate for steep terrain where the anchors are installed in predominantly soil.

TP-4 encountered weathered bedrock within ±2 feet of the ground surface in this segment. Based on the depth of the proposed pipe invert, we anticipate the pipe will be bedded in bedrock. We recommend the concrete collars be embedded at least 3 feet below the rock surface to provide anchoring in rock. All loose soil or rock fragments should be removed from the excavations for the anchors and the concrete should be poured neat against undisturbed rock. We understand the standard slope anchor detail includes weep holes at the bottom to allow water to flow through the buried structures at a controlled rate. We recommend providing a perforated drain to collect and relieve any water that may tend to accumulate in the trench backfill at the base of all steep slope segments.

If additional uplift or lateral resistance is required due to hydraulic or seismic loads, rock anchors can be installed to secure the concrete slope anchors to the bedrock. For design, a rock-to-grout bond strength of 50 psi may be used. This value assumes the rock anchors will extend at least 10 feet into R1 bedrock. The capacity of the upper 2 feet of the anchors should be disregarded due to disturbance.

Surface Restoration

The surface of the trenches in undeveloped areas should be restored as soon as possible following construction. The risk of surface erosion is particularly high in steep terrain. Therefore, we recommend the surface of the trench backfill be covered with a thin layer of soil and seeded as soon as possible so there is a mature cover of vegetation prior to the onset of wet weather. If construction extends into wet weather, additional erosion control measures such as jute mats may be required.

Seismic and Geologic Hazards

Based on our initial reconnaissance report and the present work, we concur that there are no seismic or geologic hazards that would preclude construction of the water main. We concluded in the previous report that the slopes are steep, but they are also underlain by shallow bedrock, precluding the formation of deep-seated slope failures. However, since the steeper slopes are covered with a thin layer of possible fill or colluvium, some minor slope creep is likely. The only other hazard would be an earthquake originating from the Cascadia Subduction Zone producing extended, strong shaking. Again, much of the slopes and segments of the Route A alignment are underlain by shallow or relatively shallow bedrock, reducing the risk of damage to the water main from earthquake shaking.

Risks from Trenching and Construction Vibrations

The selected alignment initially runs through a predominantly residential area with a few commercial buildings. There are homes relatively close to West Avenue. Depending on the final alignment determination, trenching in many areas may be close to other hardscapes such as curbs, sidewalks, and driveways.

If the contractor elects to use vibratory compaction equipment, it is likely the home residents and employees at commercial buildings with limited set back from construction will feel vibrations. Construction vibrations can be felt by humans at much lower levels than what is required to actually damage residences. However, felt vibrations can often lead to perceptions of construction-related damage and claims. Options to reduce the likelihood of claims include pre-construction surveys of the condition of adjacent commercial buildings and homes, pre-construction contact or meetings with the affected residents to explain the project and the expected noise and vibration levels, and providing quick responses during construction to address any complaints or concerns. At locations where claims are anticipated, ground vibrations can be measured to document the vibration levels.

DESIGN REVIEW/CONSTRUCTION OBSERVATION/TESTING

We should be provided the opportunity to review all drawings and specifications that pertain to design and construction of the proposed water line. Site preparation will require field confirmation of soil, rock and ground water conditions within the trenches. Mitigation of any ground water infiltration, caving sidewalls, or soft trench bottom conditions will require engineering review and judgment. That judgment should be provided by one of our representatives. Frequent field density tests should be run on all fill. We recommend that we be retained to provide the necessary construction observations.

VARIATION OF SUBSURFACE CONDITIONS, USE OF THIS REPORT, AND WARRANTY

The analysis, conclusions, and recommendations contained herein assume that the soil profiles encountered in the explorations and ground water levels recorded in the test pits are representative of the site conditions along the proposed alignment. The above recommendations assume we will have the opportunity to review final drawings and be present during construction to confirm the assumed soil and rock conditions. No changes in the enclosed recommendations should be made without our approval. We will assume no responsibility or liability for any engineering judgment, inspection, or testing performed by others.

This report was prepared for the exclusive use of Murraysmith, the City of Roseburg, and other design consultants for the West Avenue Water Main Extension project in Roseburg, Oregon. Information contained herein should not be used for other sites or for unanticipated construction without our written consent. This report is intended for planning and design purposes. It should be clearly understood that the subsurface conditions are well known only at the exploration locations. Due to the limited field exploration program, our findings and recommendations required interpolation between widely spaced borings and tests pits. Therefore, anyone using this information should clearly understand that soil and rock conditions and ground water levels will vary along the length of the alignment. Contractors using this information to estimate construction quantities or costs do so at their own risk.

Our services do not include any survey or assessment of potential surface contamination or contamination of the soil or ground water by hazardous or toxic materials. We assume that those services, if needed, have been completed by others.

Our work was done in accordance with generally accepted soil and foundation engineering practices. No other warranty, expressed or implied, is made.

We trust this information meets your current needs and look forward to assisting you with the remainder of the project. Please do not hesitate to call if you have any questions or require further assistance.

Attachments.

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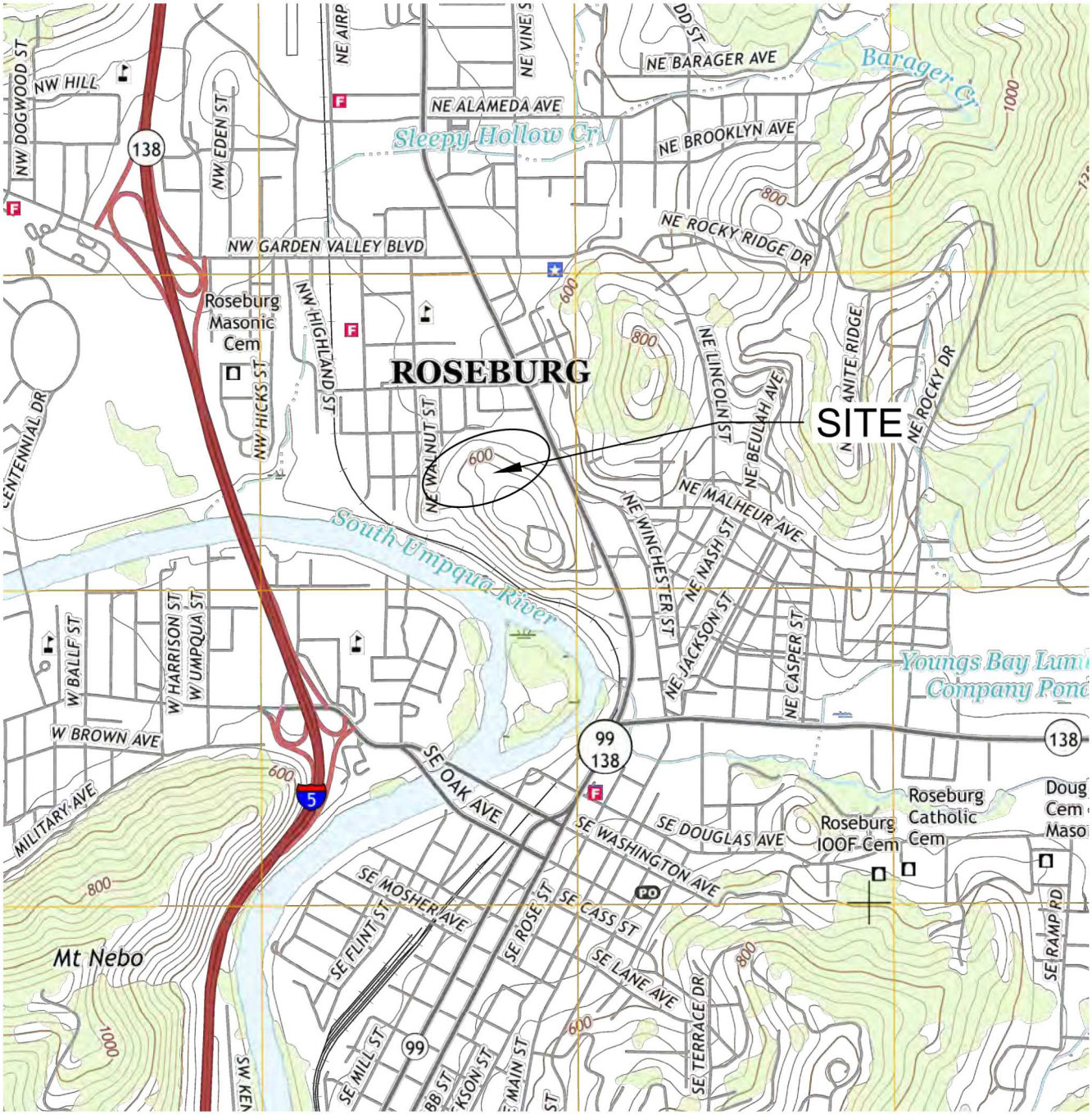
Appendix A

Figures

Foundation Engineering, Inc.
Professional Geotechnical Services



SCALE IN FEET

0 500 1,000 2,000

DATE JUNE 2019
DWN. mdm
APPR.
REVIS.
PROJECT NO.
2181121

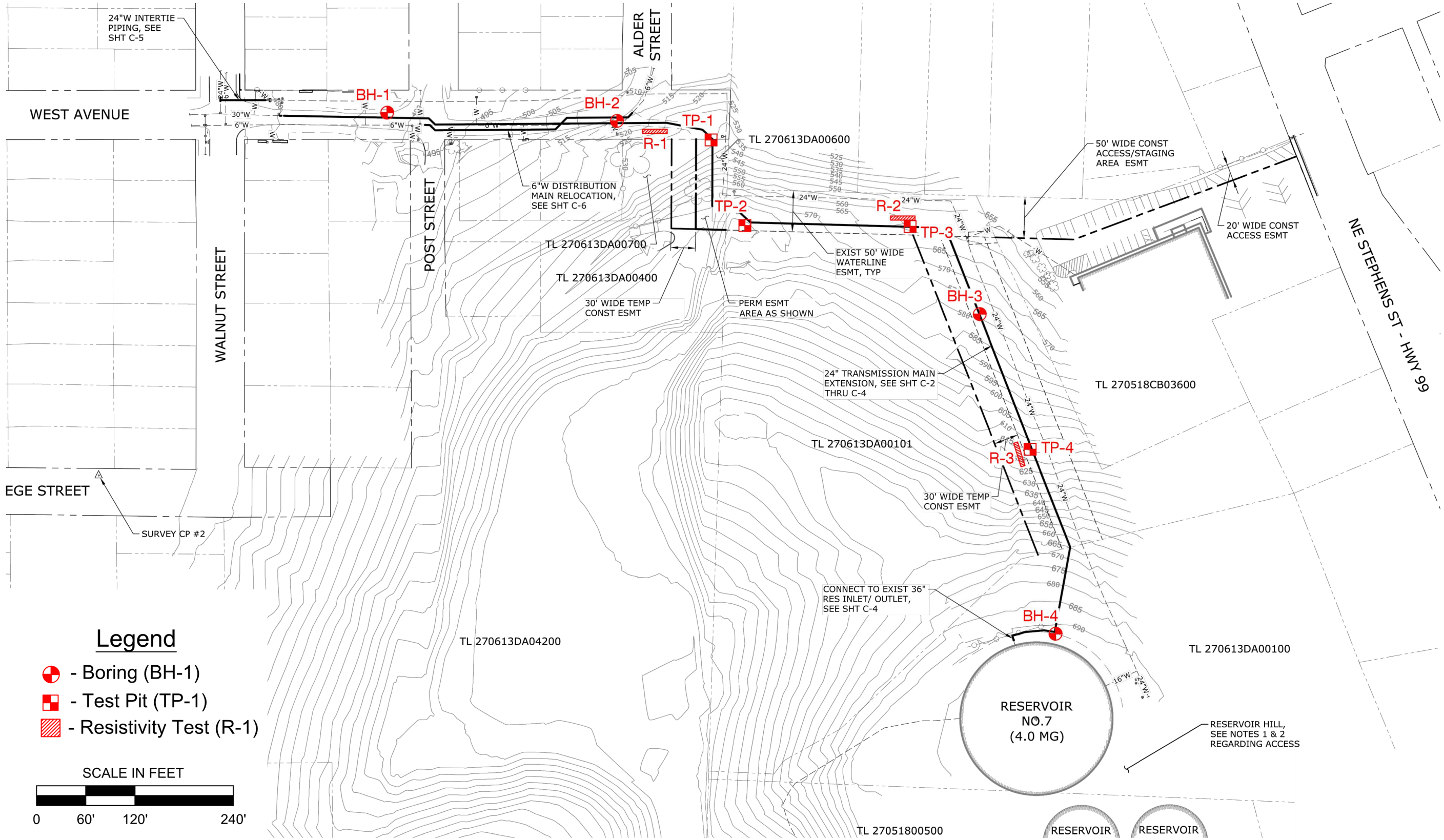
FOUNDATION ENGINEERING INC.
PROFESSIONAL GEOTECHNICAL SERVICES
820 NW CORNELL AVENUE
CORVALLIS, OR 97330-4517
BUS. (541) 757-7645 FAX (541) 757-7650

VICINITY MAP

WEST AVENUE WATER MAIN EXTENSION
ROSEBURG, OREGON

FIGURE NO.
1A

FILE NAME: Fig1A



NOTES:
1. EXPLORATION LOCATIONS ARE APPROXIMATE ONLY.
2. SEE REPORT FOR A DISCUSSION OF SUBSURFACE CONDITIONS.
3. BASE MAP PROVIDED BY MURRAYSMITH.

FOUNDATION ENGINEERING INC.
PROFESSIONAL GEOTECHNICAL SERVICES
820 NW CORNELL AVENUE
CORVALLIS, OR 97330-4517
BUS. (541) 757-7645 FAX (541) 757-7650

DATE FEB. 2020
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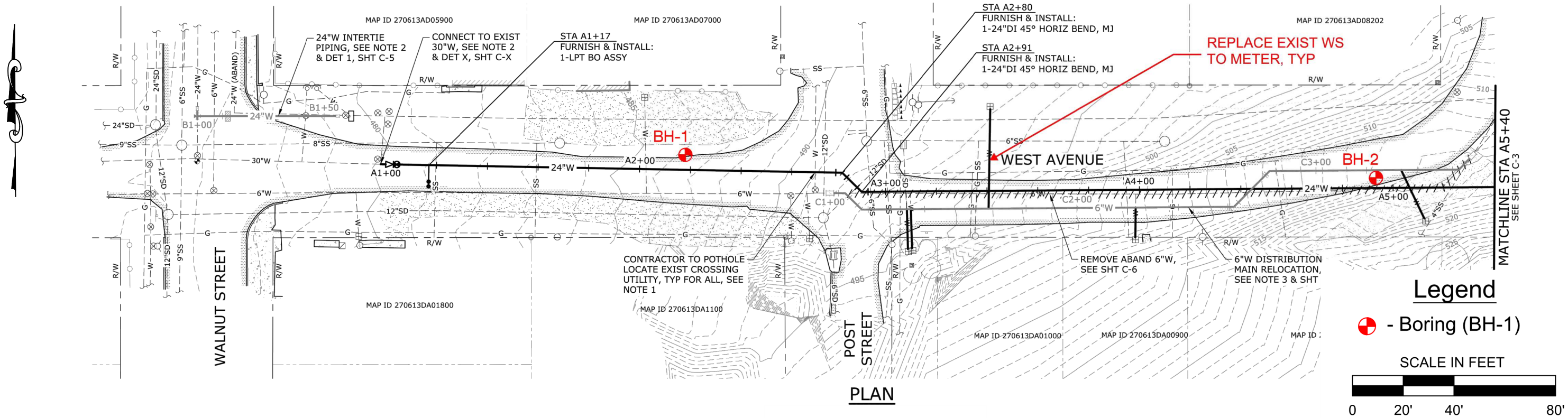
ROUTE A ALIGNMENT

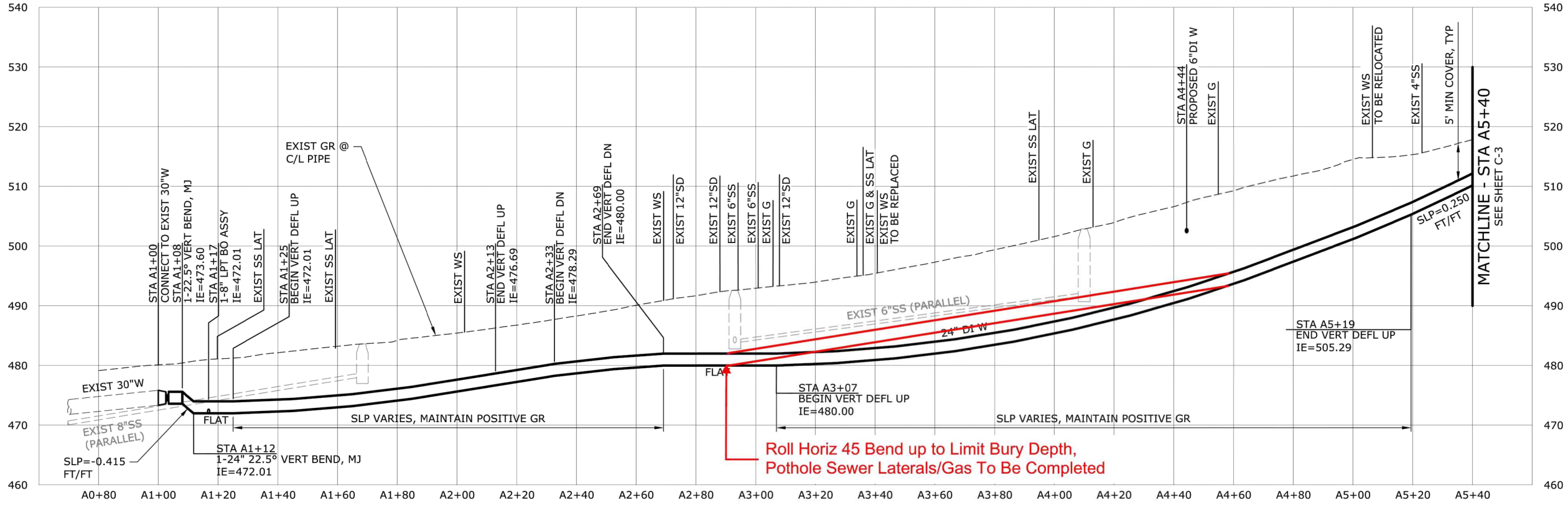
EXPLORATIONS & RESISTIVITY LOCATIONS

WEST AVENUE WATER MAIN EXTENSIOIN
ROSEBURG, OREGON

FIGURE NO. 2A

FILE NAME:FIG 2A





PLAN

NOTES:
1. EXPLORATION LOCATIONS ARE APPROXIMATE ONLY.
2. SEE REPORT FOR A DISCUSSION OF SUBSURFACE CONDITIONS.
3. BASE MAP PROVIDED BY MURRAYSMITH.

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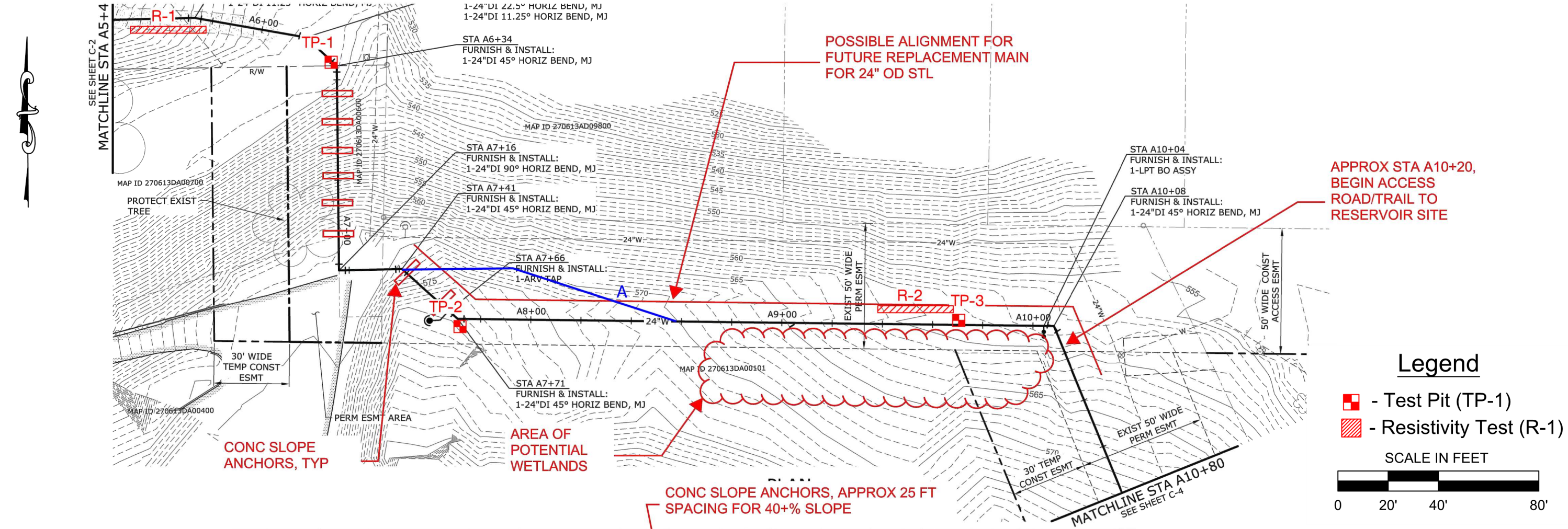
820 NW CORNELL AVENUE
CORVALLIS, OR 97330-4517
BUS. (541) 757-7645 FAX (541) 757-7650

DATE FEB. 2020
DWN. MDM
APPR.
REVIS.
PROJECT NO. 2181121

ROUTE A ALIGNMENT
EXPLORATIONS & RESISTIVITY LOCATIONS
WEST AVENUE WATER MAIN EXTENSIOIN
ROSEBURG, OREGON

FIGURE NO. 3A

FILE NAME:FIG 3A



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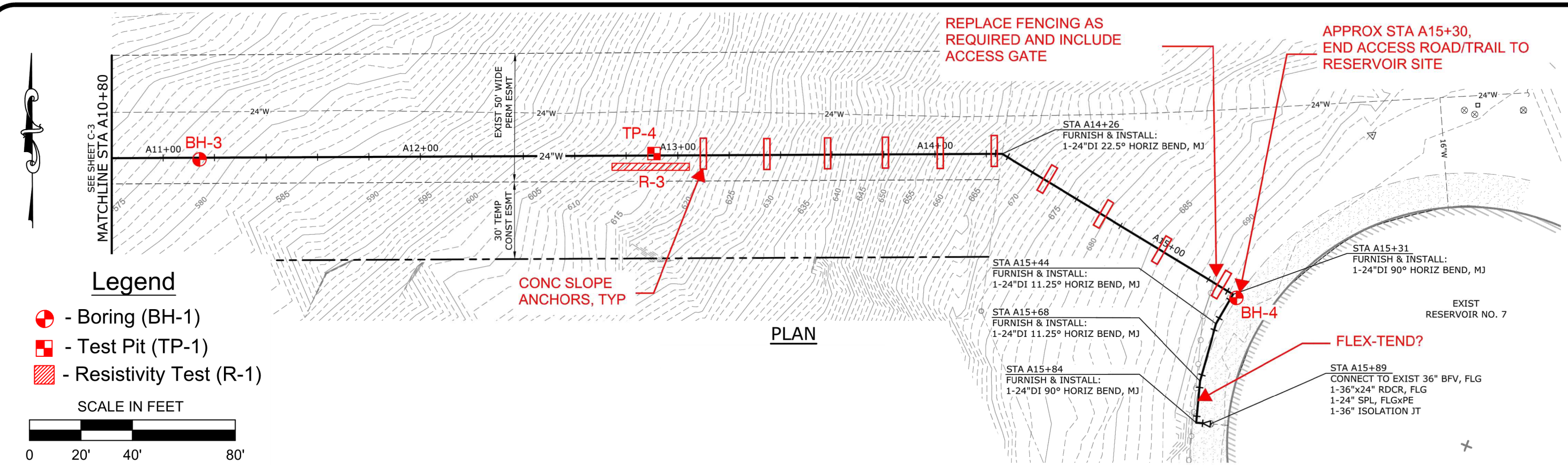
ROUTE A ALIGNMENT

EXPLORATIONS & RESISTIVITY LOCATIONS

WEST AVENUE WATER MAIN EXTENSIOIN
ROSEBURG, OREGON

FIGURE NO. **4A**

FILE NAME:FIG 4A



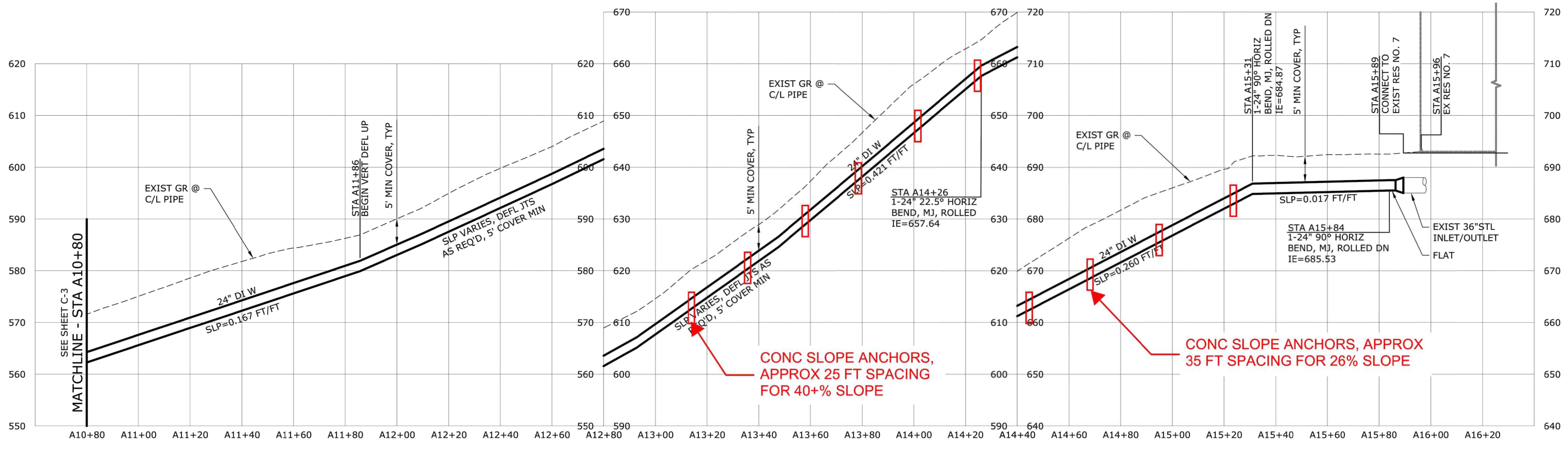
Legend

- Boring (BH-1)
- Test Pit (TP-1)
- Resistivity Test (R-1)

SCALE IN FEET

0 20' 40' 80'

PLAN



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ROUTE A ALIGNMENT

EXPLORATIONS & RESISTIVITY LOCATIONS

WEST AVENUE WATER MAIN EXTENSIOIN
ROSEBURG, OREGON

FIGURE NO. 5A

FILE NAME:FIG 5A

Appendix B

Boring and Test Pit Logs

Foundation Engineering, Inc.
Professional Geotechnical Services

DISTINCTION BETWEEN FIELD LOGS AND FINAL LOGS

A field log is prepared for each boring or test pit by our field representative. The log contains information concerning sampling depths and the presence of various materials such as gravel, cobbles, and fill, and observations of ground water. It also contains our interpretation of the soil conditions between samples. The final logs presented in this report represent our interpretation of the contents of the field logs and the results of the sample examinations and laboratory test results. Our recommendations are based on the contents of the final logs and the information contained therein and not on the field logs.

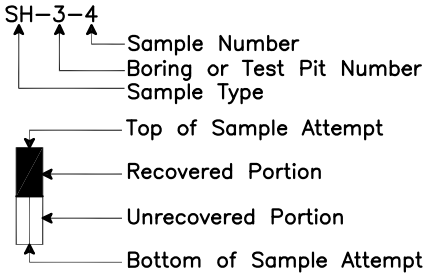
VARIATION IN SOILS BETWEEN TEST PITS AND BORINGS

The final log and related information depict subsurface conditions only at the specific location and on the date indicated. Those using the information contained herein should be aware that soil conditions at other locations or on other dates may differ. Actual foundation or subgrade conditions should be confirmed by us during construction.

TRANSITION BETWEEN SOIL OR ROCK TYPES

The lines designating the interface between soil, fill or rock on the final logs and on subsurface profiles presented in the report are determined by interpolation and are therefore approximate. The transition between the materials may be abrupt or gradual. Only at boring or test pit locations should profiles be considered as reasonably accurate and then only to the degree implied by the notes thereon.

SAMPLE OR TEST SYMBOLS



C – Pavement Core Sample
CS – Rock Core Sample
OS – Oversize Sample (3–inch split–spoon)
S – Grab Sample
SH – Thin–walled Shelby Tube Sample
SS – Standard Penetration Test Sample (split–spoon)

▲ Standard Penetration Test Resistance equals the number of blows a 140 lb. weight falling 30 in. is required to drive a standard split–spoon sampler 1 ft. Practical refusal is equal to 50 or more blows per 6 in. of sampler penetration.

● Water Content (%).

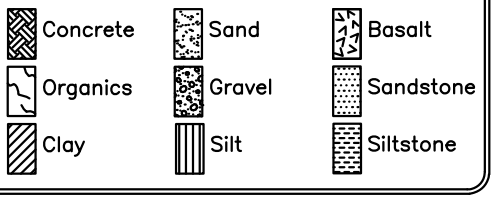
UNIFIED SOIL CLASSIFICATION SYMBOLS

G – Gravel	W – Well Graded
S – Sand	P – Poorly Graded
M – Silt	L – Low Plasticity
C – Clay	H – High Plasticity
Pt – Peat	O – Organic

FIELD SHEAR STRENGTH TEST

Shear strength measurements on test pit side walls, blocks of soil or Shelby tube samples are typically made with Torvane or Field Vane shear devices.

TYPICAL SOIL/ROCK SYMBOLS



WATER TABLE

Water Table Location

(1/31/16) Date of Measurement

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7857 SW CIRRUS DRIVE, BUILDING 24
BEAVERTON, OR 97008
BUS. (503) 641–1541

SYMBOL KEY

EXPLORATION LOGS

Explanation of Common Terms Used in Soil Descriptions

Field Identification	Cohesive Soils			Granular Soils	
	SPT*	S_u** (tsf)	Term	SPT*	Term
Easily penetrated several inches by fist.	0 – 2	< 0.125	Very Soft	0 – 4	Very Loose
Easily penetrated several inches by thumb.	2 – 4	0.125–0.25	Soft	4 – 10	Loose
Can be penetrated several inches by thumb with moderate effort.	4 – 8	0.25 – 0.50	Medium Stiff	10 – 30	Medium Dense
Readily indented by thumb but penetrated only with great effort.	8 – 15	0.50 – 1.0	Stiff	30 – 50	Dense
Readily indented by thumbnail.	15 – 30	1.0 – 2.0	Very Stiff	> 50	Very Dense
Indented with difficulty by thumbnail.	>30	> 2.0	Hard		

* SPT N–value in blows per foot (bpf)
** Undrained shear strength

Term	Soil Moisture Field Description
Dry	Absence of moisture. Dusty. Dry to the touch.
Damp	Soil has moisture. Cohesive soils are below plastic limit and usually moldable.
Moist	Grains appear darkened, but no visible water. Silt/clay will clump. Sand will bulk. Soils are often at or near plastic limit.
Wet	Visible water on larger grain surfaces. Sand and cohesionless silt exhibit dilatancy. Cohesive soil can be readily remolded. Soil leaves wetness on the hand when squeezed. Soil is wetter than the optimum moisture content and above the plastic limit.

Term	PI	Plasticity Field Test
Non–plastic	0 – 3	Cannot be rolled into a thread at any moisture.
Low Plasticity	3 – 15	Can be rolled into a thread with some difficulty.
Medium Plasticity	15 – 30	Easily rolled into thread.
High Plasticity	> 30	Easily rolled and re–rolled into thread.

Term	Soil Structure Criteria
Stratified	Alternating layers at least ¼ inch thick.
Laminated	Alternating layers less than ¼ inch thick.
Fissured	Contains shears and partings along planes of weakness.
Slickensided	Partings appear glossy or striated.
Blocky	Breaks into small lumps that resist further breakdown.
Lensed	Contains pockets of different soils.

Term	Soil Cementation Criteria
Weak	Breaks under light finger pressure.
Moderate	Breaks under hard finger pressure.
Strong	Will not break with finger pressure.

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COMMON TERMS

SOIL DESCRIPTIONS

Explanation of Common Terms Used in Rock Descriptions

Field Identification		UCS (psi)	Strength	Hardness (ODOT)
Indented by thumbnail.	R0	< 100	Extremely Weak	Extremely Soft
Crumbles under firm blows with geological hammer, can be peeled by a pocket knife.	R1	100–1,000	Very Weak	Very Soft
Can be peeled by a pocket knife with difficulty, shallow indentations made by firm blow with geological hammer.	R2	1,000–4,000	Weak	Soft
Cannot be scraped or peeled with a pocket knife, specimen can be fractured with a single blow of geological hammer.	R3	4,000–8,000	Medium Strong	Medium Hard
Specimen requires more than one blow of geological hammer to fracture it.	R4	8,000–16,000	Strong	Hard
Specimen requires many blows of geological hammer to fracture it.	R5	>16,000	Very Strong	Very Hard

Term	Weathering Field Identification
Fresh	Crystals are bright. Discontinuities may show some minor surface staining. No discoloration in rock fabric.
Slightly Weathered	Rock mass is generally fresh. Discontinuities are stained and may contain clay. Some discoloration in rock fabric.
Moderately Weathered	Significant portions of rock show discoloration and weathering effects. Crystals are dull and show visible chemical alteration. Discontinuities are stained and may contain secondary mineral deposits.
Highly Weathered (Predom. Decomp.)	Rock can be excavated with geologist's pick. All discontinuities exhibit secondary mineralization. Complete discoloration of rock fabric. Surface of core is friable and usually pitted due to washing out of highly altered minerals by drilling water.
Decomposed	Rock mass is completely decomposed. Original rock "fabric" may be evident (relict texture). May be reduced to soil with hand pressure.

Spacing (meters)	Spacing	Spacing Term	Bedding/Foliation
< 0.06	< 2 in.	Very Close	Very Thin (Laminated)
0.06 – 0.30	2 in. – 1 ft.	Close	Thin
0.30 – 0.90	1 ft. – 3 ft.	Moderately Close	Medium
0.90 – 3.0	3 ft. – 10 ft.	Wide	Thick
> 3.0	> 10 ft.	Very Wide	Very Thick (Massive)

Vesicle Term	Volume
Some vesicles	5 – 25%
Highly vesicular	25 – 50%
Scoriaceous	> 50%

Stratification Term	Description
Lamination	<1 cm (0.4 in.) thick beds
Fissile	Preferred break along laminations
Parting	Preferred break parallel to bedding
Foliation	Metamorphic layering and segregation of minerals

RQD %	Designation	RQD %	Designation
0 – 25	Very Poor	75 – 90	Good
25 – 50	Poor	90 – 100	Excellent
50 – 75	Fair		

Rock Quality Designation (RQD) is the cumulative length of intact pieces 4 inches or longer excluding breaks caused by drilling and handling divided by run length, expressed as a percentage.

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COMMON TERMS

ROCK DESCRIPTIONS

Depth Feet	Soil and Rock Description and Comments	Elev. Depth	Samples	SPT, N-Value / Recovery / Moisture, % / RQD., % (0 — 50 — 100)	Backfill/ Installations/ Water Table
		486.5			
	ASPHALTIC CONCRETE (±2 to 4 inches).	486.2			Capped with AC cold patch and gravel
	Medium dense CRUSHED ROCK (GP); dark grey, moist to wet, fine angular rock, (base rock).	0.3			
1	Soft CLAY (CH); dark grey, moist to wet, medium to high plasticity, (possible fill/colluvium).	485.5 1.0			
2					
3			SS-1-1	4	
4					
5		481.4	SS-1-2	16	Backfilled with bentonite chips
	Stiff SILT, some sand (ML); light brown, moist, low plasticity, fine to medium sand, (residual soil).	5.1			
6					
7					
			SS-1-3	8	
8					
9					
10			SS-1-4	9	
11					
12					
	Medium stiff below ±12.5 feet.		SS-1-5	7	
13					
14		472.0			
	Extremely weak to very weak (R0 to R1) SANDSTONE; dark brown, moderately to slightly weathered, fine sand, basaltic, (Siletz River Volcanics, Roseburg member).	14.5			
15			SS-1-6	50/5"	
	BOTTOM OF BORING	470.6 15.9			

Project No.: 2181121

Surface Elevation: 486.5 feet (Approx.)

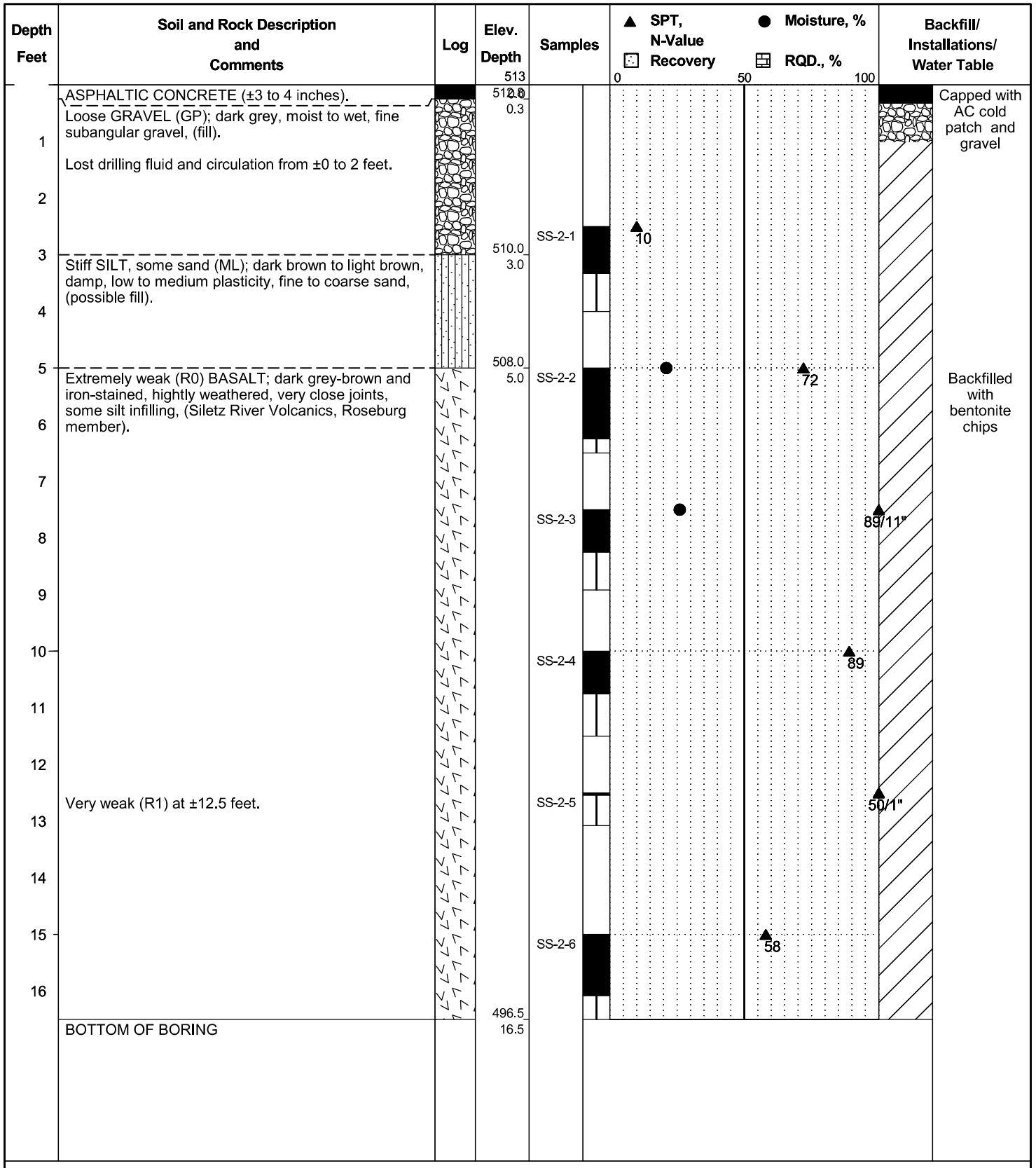
Date of Boring: January 13, 2020

Boring Log: BH-1

West Avenue Water Main Extension

Roseburg, Oregon

Foundation Engineering, Inc.



Project No.: 2181121

Surface Elevation: 513.0 feet (Approx.)

Date of Boring: January 13, 2020

Boring Log: BH-2

West Avenue Water Main Extension

Roseburg, Oregon

Foundation Engineering, Inc.

Depth Feet	Soil and Rock Description and Comments	Elev. Depth (577.5)	Samples	SPT, N-Value	Backfill/ Installations/ Water Table
0	Soft grading to stiff CLAY (CH); dark brown, moist, high plasticity, (colluvium).	0.0			Backfilled with bentonite chips
2.5			SS-3-1	4	
5	Scattered fine roots to ±5 feet.		SS-3-2	12	
7.5	Stiff CLAY, some sand (CH); light brown, moist, medium plasticity, fine to medium sand, (residual soil).	570.0 / 7.5	SS-3-3	8	
10			SS-3-4	9	
12.5			SS-3-5	32	
13	Extremely weak (R0) SILTSTONE; brown and iron-stained, highly weathered, very close joints, silt-infilled, (Siletz River Volcanics, Roseburg member).	564.5 / 13.0			
15	No iron staining and silt infilling below ±15 feet.		SS-3-6	68	
17.5	Very weak (R1), dark grey-brown, and moderately weathered below ±17.5 feet.		SS-3-7	50/3"	
18.3	BOTTOM OF BORING	559.3 / 18.3			

Legend: ▲ SPT, N-Value; ● Moisture, %; Recovery; RQD., % (scale 0 – 50 – 100)

Project No.: 2181121

Surface Elevation: 577.5 feet (Approx.)

Date of Boring: January 13, 2020

Boring Log: BH-3

West Avenue Water Main Extension

Roseburg, Oregon

Foundation Engineering, Inc.

Depth Feet	Soil and Rock Description and Comments	Log	Elev. Depth 692	Samples	SPT, N-Value / Moisture, % / Recovery / RQD., % (0 – 50 – 100)	Backfill/ Installations/ Water Table
1	Dense to very dense sandy GRAVEL, some silt (GP-GM); brown, moist, low plasticity silt, fine to coarse sand to fine to coarse angular gravel, (fill).		0.0			Capped with gravel
2						
3				SS-4-1	73	
			688.8			
4	Extremely weak to weak (R0 to R2) BASALT; dark grey-brown, highly weathered to moderately weathered, very close joints, (Siletz River Volcanics, Roseburg member).		3.2			
	Iron-stained from ±3.2 to 7.5 feet.					
5				SS-4-2	50/1st 5½"	Backfilled with bentonite chips
6						
7						
8				SS-4-3	50/1st 3"	
9						
10				SS-4-4	50/1st 5"	
11						
12						
13				SS-4-5	50/1st 3"	
14						
15				SS-4-6	50/1st 3"	
16						
17						
			674.2	SS-4-7	50/1st 4"	
	BOTTOM OF BORING		17.8			

Project No.: 2181121

Surface Elevation: 692.0 feet (Approx.)

Date of Boring: January 14, 2020

Boring Log: BH-4

West Avenue Water Main Extension

Roseburg, Oregon

Foundation Engineering, Inc.

Comments	Depth, Feet	Sample #	Location	C, TSF	Elev. Depth	Symbol	Soil and Rock Description
Surface: grass and weeds Abundant fine roots extend to ±3 inches and scattered fine roots extend to ±1.3 feet. Piece of ±½-inch rebar at ±6 inches. CASE CX210D encountered practical digging refusal at ±7 feet. No seepage or ground water encountered to the limit of exploration.	1 2 3 4 5 6 7 8 9 10 11 12 13 14	S-1-1 S-1-2			532.6 1.4 527.0 7.0		Medium stiff clayey SILT, some gravel (MH); dark brown, moist, medium plasticity, fine to coarse angular to subangular basaltic gravel, (fill). Gravelly below ±0.3 feet Weak (R2) BASALT; dark grey-brown, moderately to slightly weathered, very close to close joints are irregular, rough, silt-infilled, and manganese-stained, (Siletz River Volcanics, Roseburg member). No silt infilling below ±2 feet. Close joints below ±4 feet. Medium strong (R3) and slightly weathered below ±6 feet. BOTTOM OF EXPLORATION

Project No.: 2181121

Surface Elevation: 534.0 feet (Approx.)

Date of Test Pit: January 15, 2020

Test Pit Log: TP-1

West Avenue Water Main Extension

Roseburg, Oregon

Comments	Depth, Feet	Sample #	Location	C, TSF	Elev. Depth	Symbol	Soil and Rock Description
Surface: grass, weeds, and blackberries Fine roots extend to ±18 inches. Test pit sidewalls caving from ±3 to 11 feet. No seepage or ground water encountered to the limit of exploration.	1 2 3 4 5 6 7 8 9 10 11 12 13 14	S-2-1 S-2-2			576.0 3.5 566.5 13.0		Medium stiff to stiff gravelly clayey SILT, some sand (MH); light brown, moist, medium plasticity, fine sand to coarse angular to subangular gravel (possible fill). Stiff to very stiff gravelly CLAY (CH); light brown and iron-stained, moist, high plasticity, fine sand to coarse angular to subangular siltstone gravel, (residual soil). BOTTOM OF EXPLORATION

Project No.: 2181121

Surface Elevation: 579.5 feet (Approx.)

Date of Test Pit: January 15, 2020

Test Pit Log: TP-2

West Avenue Water Main Extension

Roseburg, Oregon

Comments	Depth, Feet	Sample #	Location	C, TSF	Elev. Depth	Symbol	Soil and Rock Description
Surface: grass, weeds, and blackberries	1	S-3-1			558.0		Soft to medium stiff clayey SILT, some sand and gravel (MH); light brown, moist, medium plasticity, fine to coarse sand to fine to coarse angular to subangular gravel, (fill).
Fine roots extend to ±6 inches.	2	S-3-2			1.5		Stiff clayey SILT, some sand and gravel (MH); brown mottled grey, moist, medium to high plasticity, fine to coarse sand, fine subangular gravel, (possible colluvium/residual soil).
	3				556.0		
Glass shard at ±1 foot.	4	S-3-3			3.5		Very stiff to hard CLAY, some silt (CL); light brown and iron-stained, damp, high plasticity, (residual soil).
	5						
Roots up to ±½-inch diameter extend to ±2.5 feet.	6	S-3-4					Relict rock texture below ±6 feet.
	7						
	8				551.0		
	9	S-3-5			8.5		Very weak (R1) SILTSTONE; dark grey, slightly weathered, close joints are planar, smooth to rough, and manganese-stained, some thin (±½-inch thick) sandstone interbeds, (Siletz River Volcanics, Roseburg member).
	10						
	11						
No seepage or ground water encountered to the limit of exploration.	12	S-3-6			546.5		
	13				13.0		BOTTOM OF EXPLORATION
	14						

Project No.: 2181121

Surface Elevation: 559.5 feet (Approx.)

Date of Test Pit: January 15, 2020

Test Pit Log: TP-3

West Avenue Water Main Extension

Roseburg, Oregon

Comments	Depth, Feet	Sample #	Location	C, TSF	Elev. Depth	Symbol	Soil and Rock Description
Surface: blackberries and weeds with cut decomposing grass and organic debris	1				609.9		Soft to medium stiff clayey SILT, some gravel (MH); dark brown, moist, medium plasticity, fine to coarse angular to subangular gravel, (topsoil/colluvium).
Fine roots extend to ±16 inches.	2	S-4-1			1.6		Medium stiff SILT, some sand (ML/CL); light brown, moist, medium plasticity, fine to coarse sand, (residual soil).
	3	S-4-2			609.5		
Roots up to ±½-inch diameter extend to ±2 feet.	4	S-4-3			2.0		Extremely weak (R0) BASALT; dark grey-brown and iron-stained, highly weathered, very close joints are irregular, rough, iron and manganese-stained and silt-infilled, (Siletz River Volcanics, Roseburg member).
Very slow seepage at ±3.5 feet.	5				608.0		
	6				3.5		Very weak to weak (R1 to R2) BASALT; dark grey, moderately weathered, very close to close joints are irregular, rough, and iron and manganese-stained, (Siletz River Volcanics, Roseburg member).
	7						
	8						
	9						
	10						
	11						
	12						
	13				598.5		
	14				13.0		BOTTOM OF EXPLORATION

Project No.: 2181121

Surface Elevation: 611.5 feet (Approx.)

Date of Test Pit: January 15, 2020

Test Pit Log: TP-4

West Avenue Water Main Extension

Roseburg, Oregon

Appendix C

Field and Laboratory Testing

Foundation Engineering, Inc.
Professional Geotechnical Services

Table 1C. Water Contents and Atterberg Limits

Sample Number	Sample Depth (feet)	Water Content (percent)	LL	PL	PI	USCS Classification
SS-1-2	5.0 – 6.5	31.0				
SS-1-3	7.5 – 9.0	27.4	44	33	11	ML
SS-1-4	10.0 – 11.5	37.4				
SS-2-2	5.0 -6.5	21.0				
SS-2-3	7.5 -8.9	26.0				
SS-3-1	2.5 – 4.0	30.9				
SS-3-2	5.0 – 6.5	26.3	75	32	43	CH
SS-3-3	7.5 – 9.0	26.5	53	24	29	CH
SS-3-4	10.0 – 11.5	23.0				
S-2-2	3.5 – 4.5	22.2				
S-3-2	2.0 – 3.0	27.6				
S-3-3	3.5 – 4.5	21.3				
S-4-1	1.5 – 2.0	35.0	44	27	17	ML/CL

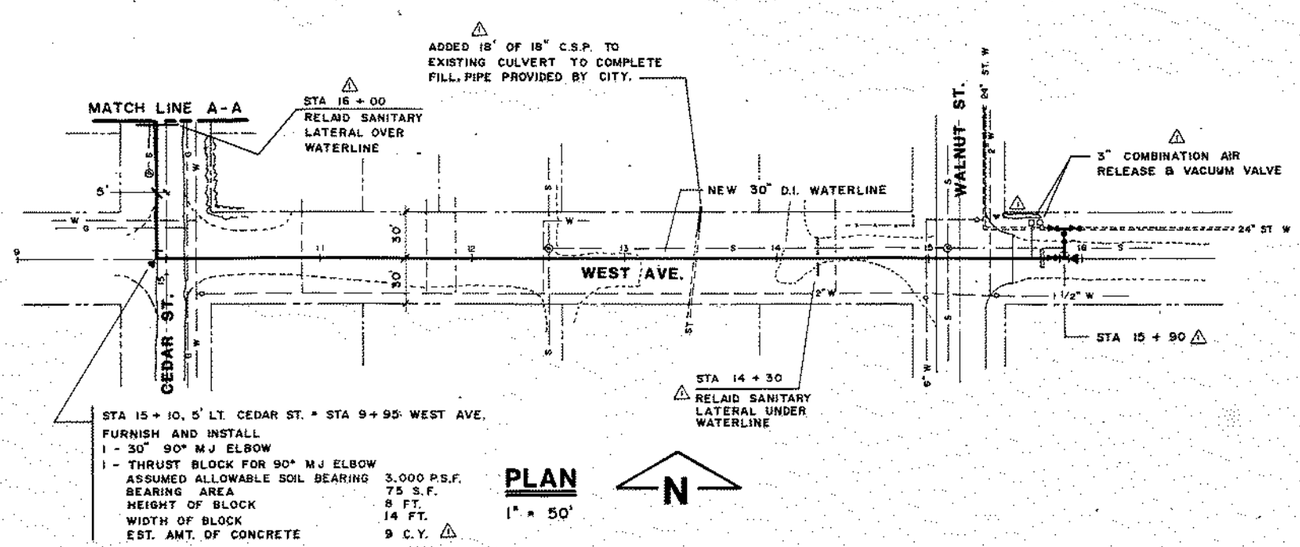
Table 2C. Resistivity Results (ASTM G57)

Location	Pin Spacing (feet)	Resistivity (Ω-cm)
R-1 Between BH-2 and TP-1	2	4,213
	5	4,213
	10	5,745
R-2 Near TP-2	2	2,336
	5	2,011
	10	2,490
R-3 Near TP-4	2	2,834
	5	2,968
	10	3,256

Table 3C. pH Test Results (ASTM G51)

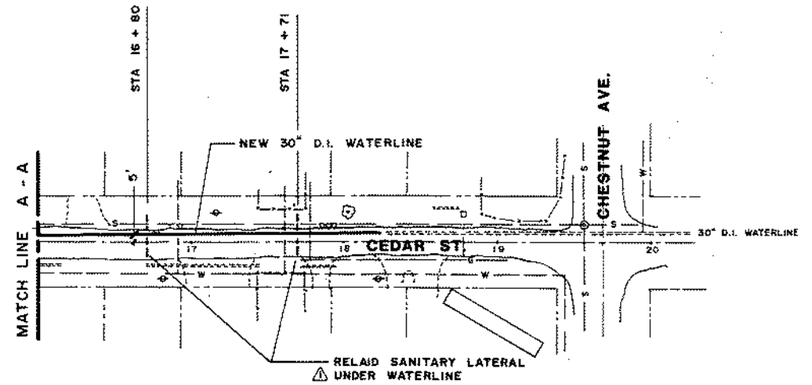
Sample Number	Sample Depth (feet)	Sample Description	pH
S-1-1	0.5 to1.5	Dark brown clayey SILT; some gravel	6.5
S-3-2	3.5 to 4.5	Brown mottled grey clayey SILT; some sand and gravel	6.0
S-4-1	1.6 to 2.0	Light brown SILT some sand	6.2

C - Existing City of Roseburg Water Line Record Drawings, Asbuilts, etc.



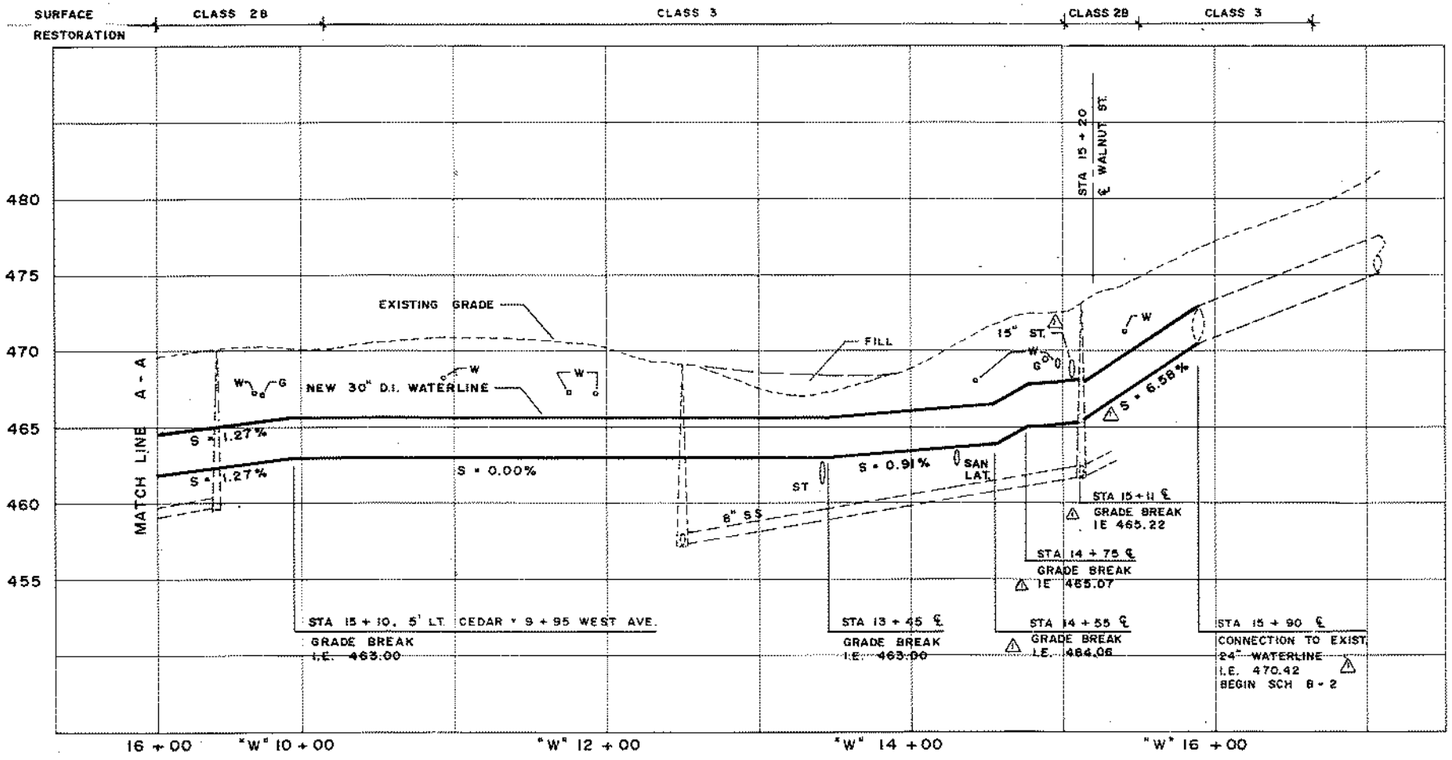
PLAN
1" = 50'

N

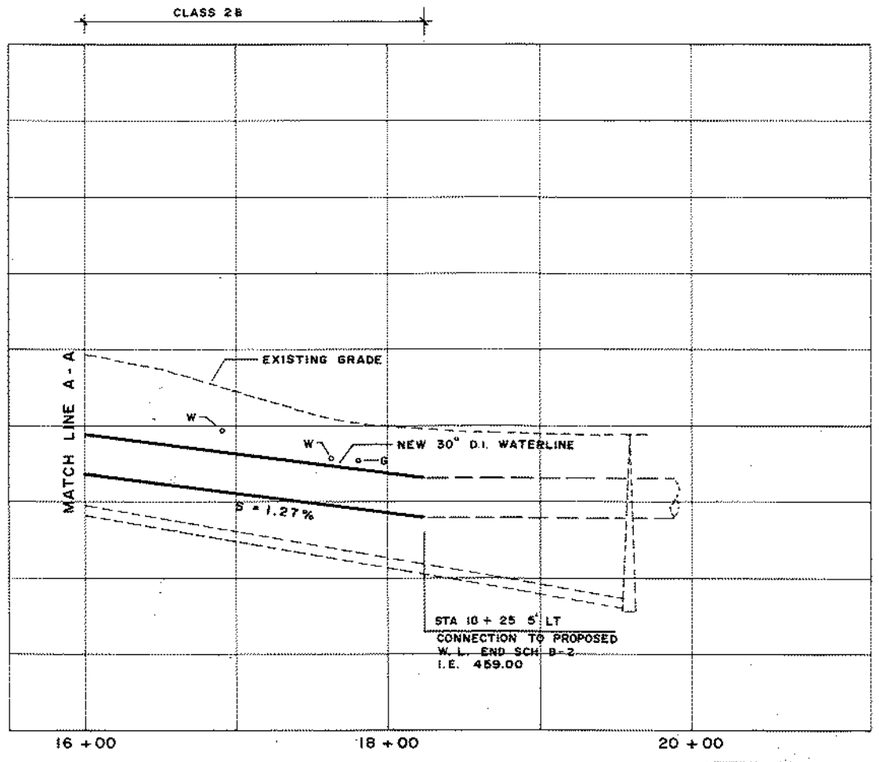


PLAN
1" = 50'

N



PROFILE
HORIZ. 1" = 50', VERT. 1" = 5'



PROFILE
HORIZ. 1" = 50', VERT. 1" = 5'

DATE	NO.	REVISION	BY
DEC. 88	1	DRAWING OF RECORD	FZ

DES. R C G | FILE NO. 949.02
DRN. F Z | SCALE: AS SHOWN | DATE: FEB. 88
CH. D A L | APPROVED:

PROJECT: CITY OF ROSEBURG
CEDAR ST. IMPROVEMENTS

SHEET TITLE: SCHEDULE B - PHASE II
30" TRANSMISSION MAIN
PLAN & PROFILE

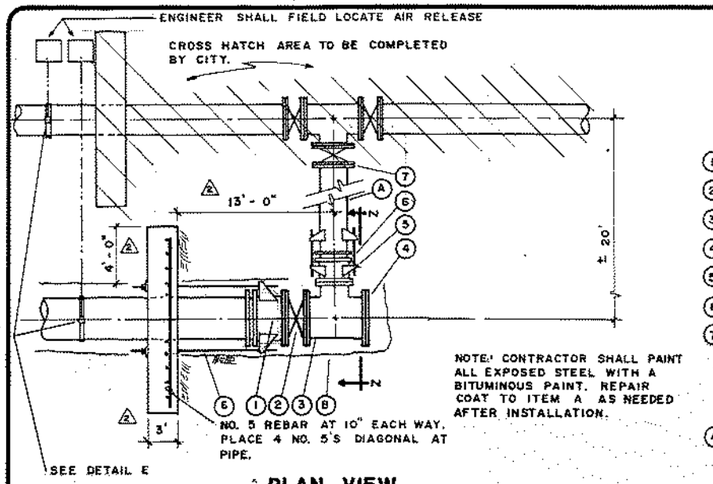
LEE ENGINEERING, INC.
CONSULTING ENGINEERS
OREGON CITY, OREGON

Registered Professional Engineer OREGON Dan D. Lee

FILE NO. 949.02
SHEET NO. 6/8

5-134

87-13c 4/4



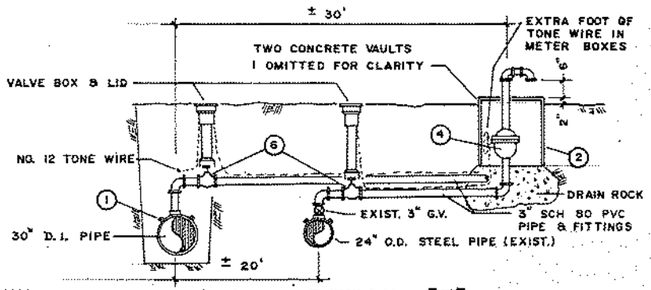
PLAN VIEW

DETAIL "D" FITTINGS

1. 30" FLG. COUPLING ADPT. (ROMAC STYLE "FC 400" OR EQUAL) W/ HARNESS LUGS TYPE P OR RR PER LATEST EDITION AWWA M11
2. 30" FLG B.F.V. W/VALVE BOX & LID
3. 30" X 24" FLG TEE
4. 30" BLIND FLANGE
5. 24" FLG COUPLING ADPT. (ROMAC STYLE "FC 400" OR EQUAL) W/ HARNESS LUGS TYPE P OR RR PER LATEST EDITION AWWA M11
6. 1¼" TIE RODS W/NUTS & WASHERS - ASTM A572, GR 50 FOR TIE ROD MATERIAL
7. 24" NEOPRENE - FACED FULL FACE GASKET FLANGE INSULATING KIT W/DOUBLE WASHER SET OF POLYETHYLENE OR MYLAR SLEEVES, PHENOLIC AND STEEL WASHERS. CITY INSTALLED. ⚠2

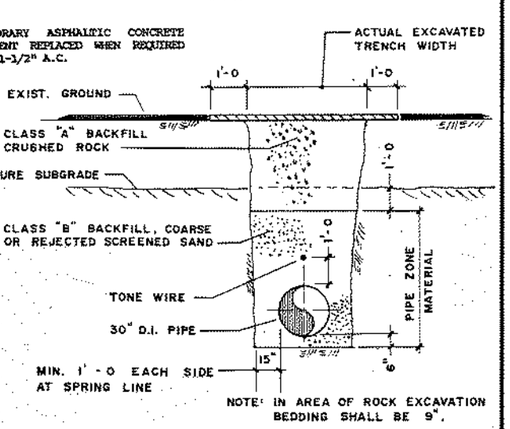
OWNER SUPPLIED & DELIEVERED TO JOB SITE. CONTRACTOR INSTALLED.

(A) 24" FLG X PE BITUMASTIC COATED STEEL SPOOL CITY INSTALLED. ⚠2



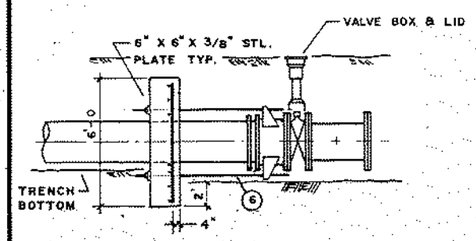
DETAIL "E"

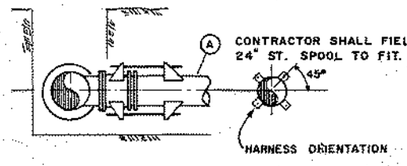
N.T.S.



TYP. WATERLINE TRENCH

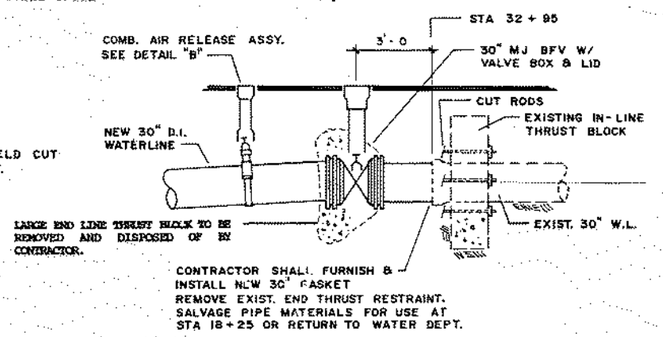
N.T.S.





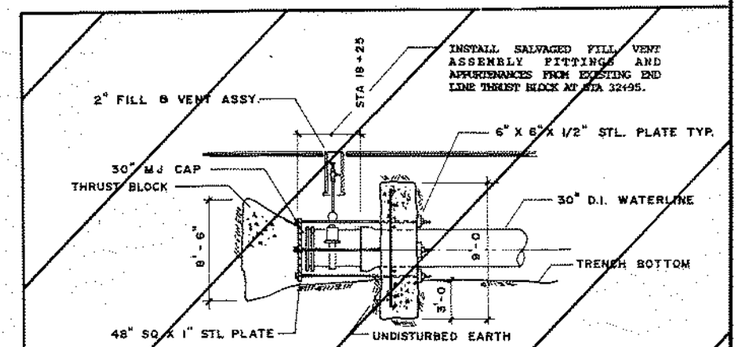
SEC. Z - Z ⚠

N.T.S.



STA 32 + 95 TIE - IN

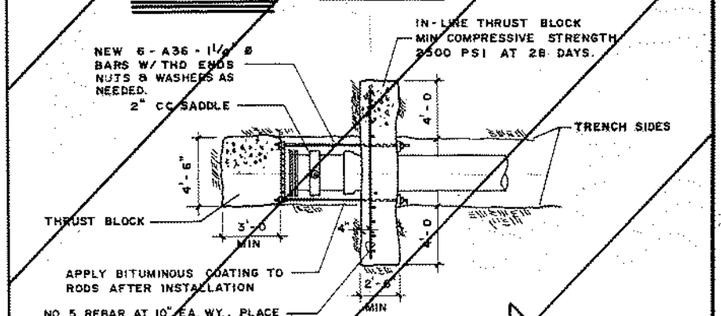
N.T.S.



⚠2

N. T. C.

ELEVATION



PLAN VIEW

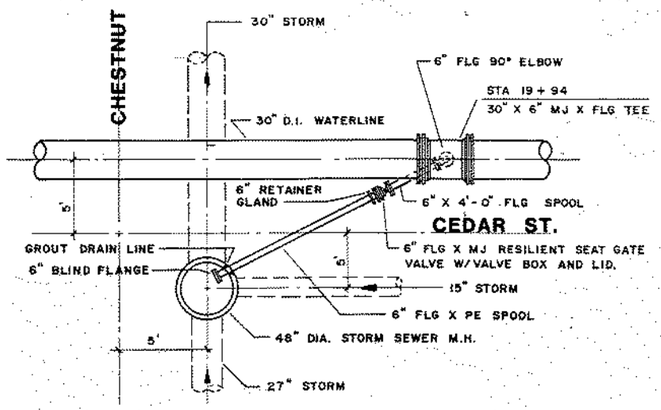
DETAIL "A"

N.T.S.

ELEVATION

DETAIL "D" ⚠

N.T.S.



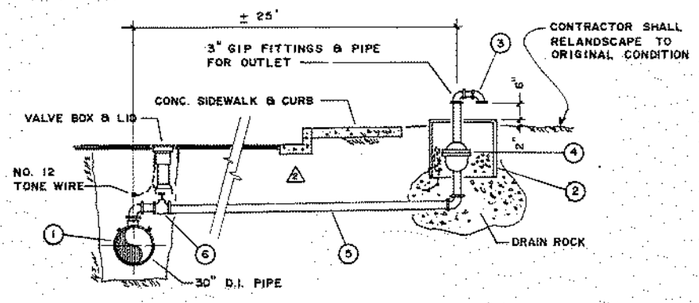
DRAIN DETAIL "C"

N.T.S.

DETAIL "B" & "E" FITTINGS

1. 30" x 3" FABRICATED STEEL SADDLE. 18-8 STAINLESS STEEL STRAPS. STEEL SADDLE SHALL BE COATED WITH A BITUMASTIC COATING.
2. 18" DIAMETER X 2' VALVE BOX W/LID OR TWO BROOKS NO. 36 METER BOXES STACKED ON TOP OF EACH OTHER.
3. FIELD LOCATE 3" VALVE NEXT TO EXISTING 2" WATER SERVICE IN LANDSCAPED AREA.
4. 3" APCO 147C COMBINATION AIR RELEASE VALVE OR APPROVED EQUAL.
5. 3" SCHEDULE 80 PVC PIPE & FITTINGS. BORE OR PUSH PIPE UNDER SIDEWALK & CURB.
6. 3" GATE VALVE W/2" OPERATING NUT.

NOTE: UNDERGROUND UTILITIES (ELECTRICAL, TELEPHONE, WATER, IRRIGATION, GAS, ETC.) ARE PRESENT IN AREA OF AIR RELEASE VALVE WORK. CONTRACTOR SHALL PROTECT ALL UTILITIES AND SHALL BE SOLELY & DIRECTLY RESPONSIBLE FOR ANY DAMAGE TO UTILITIES.



DETAIL "B"

N.T.S.

DATE	NO	REVISION	BY
MAR. 88	⚠1	CHANGES FOR ADDENDUM NO. 1	RCG
DEC. 88	2	DRAWING OF RECORD	FZ

DES. R C G | DRW. F Z | CH. D A L | FILE NO. 949.03 | SCALE AS SHOWN | DATE FEB 88 | APPROVED

PROJECT: CITY OF ROSEBURG CEDAR ST. IMPROVEMENTS

SHEET TITLE: SCHEDULE B - PHASE I & II 30" TRANSMISSION MAIN & MISCELLANEOUS DETAILS

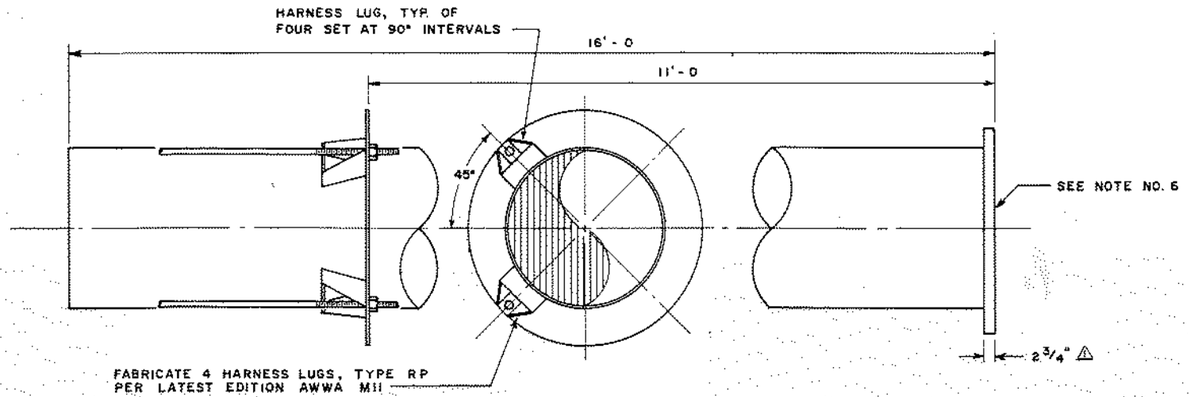
LEE ENGINEERING, INC. CONSULTING ENGINEERS OREGON CITY, OREGON

Registered Professional Engineer OREGON Donald R. Lee

FILE NO. 949.03

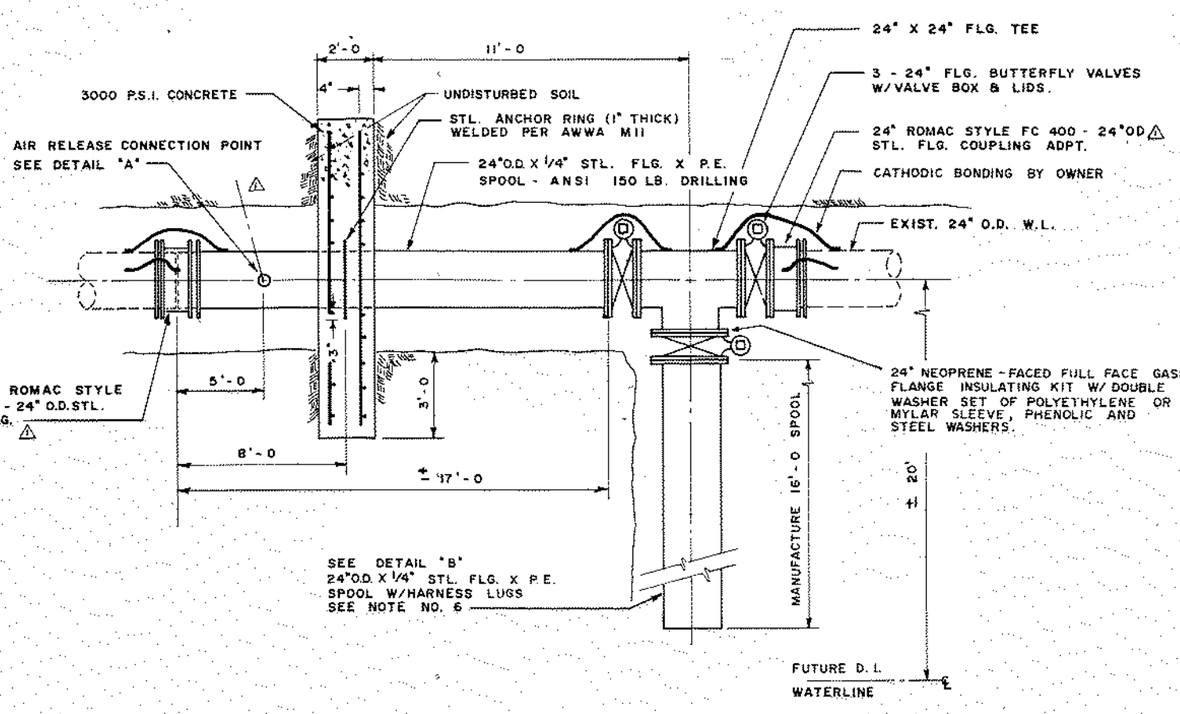
SHEET NO. 7/8

5-133 87-13c 3/4



DETAIL "B"

N.T.S.



PLAN

3/8" = 1' - 0"

N

CONSTRUCTION NOTES

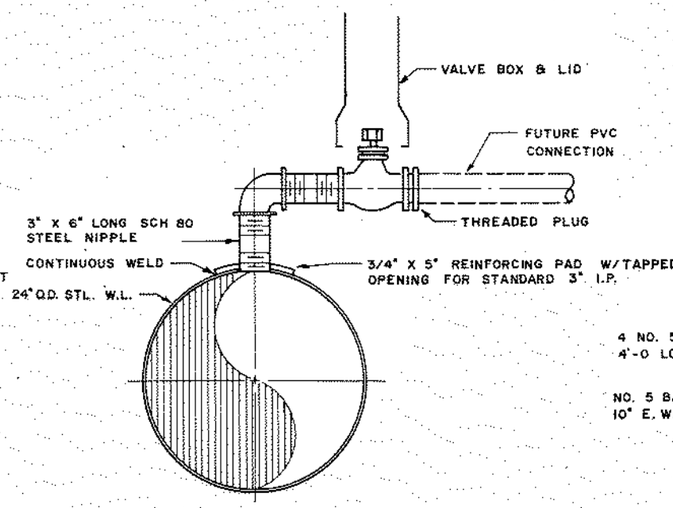
1. All fabricated components shall comply with the latest edition of AWWA M11. (Steel Pipe - A Guide for Design and Installation)
2. Coatings

   Prepare all exterior surfaces and the interior surface of the two 24" spools in accordance with Steel Structures Painting Council No. 10 Near-White Blast Cleaning (SSPC - SP10).

   Exterior coating shall be Porter Coating Tar Set Maxi-Build II 7080 or approved equal. Application of 16 mil dry shall be in strict compliance with manufacturer recommended application procedure.

   Paint supplier shall include two gallons of Porter Coating Tar Set Maxi-Build II 7080 to Owner for field touch-up work.

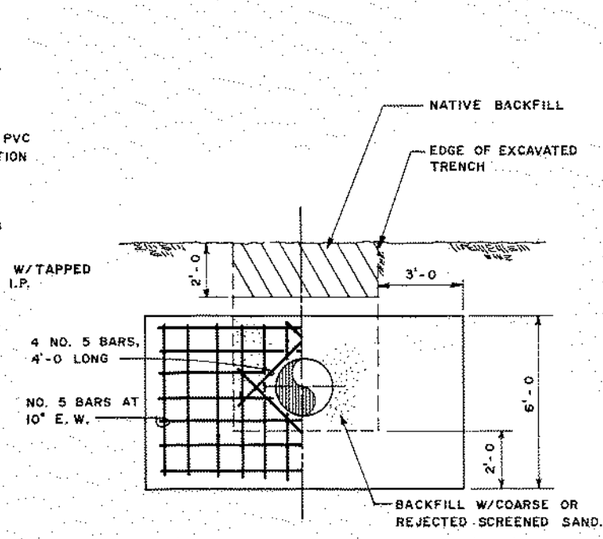
   Interior coating for the two 24" steel spools shall be Koppers Protective Coating "Bitumastic Super Tank Solution-High Solids." Application of 8 mil dry shall be in strict compliance with manufacturer recommended application procedure.
3. Owner shall excavate existing 24" O.D. STL. waterline to locate existing couplings. Locate tie-in as to minimize cuts, new couplings and thermite welds.
4. Owner shall design, install and maintain cathodic protection system.
5. Owner shall record depth of new 24" x 24" FLG TEE for drawing of record.
6. Steel pipe flanges shall be a class E flange in conformance with the latest edition of AWWA C207.



DETAIL "A"

AIR RELEASE CONNECTION POINT

N.T.S.



IN - LINE THRUST BLOCK

N.T.S.

DATE	NO	REVISION	BY
DEC. 88	△	DRAWING OF RECORD	F Z

DES R C G | FILE NO 949.07 A
DRW F Z | SCALE AS SHOWN | DATE APR. 88
CH D A L | APPROVED

PROJECT: CITY OF ROSEBURG
CEDAR STREET IMPROVEMENTS

SHEET TITLE: 30" TRANSMISSION MAIN
WEST AVE. TIE - IN

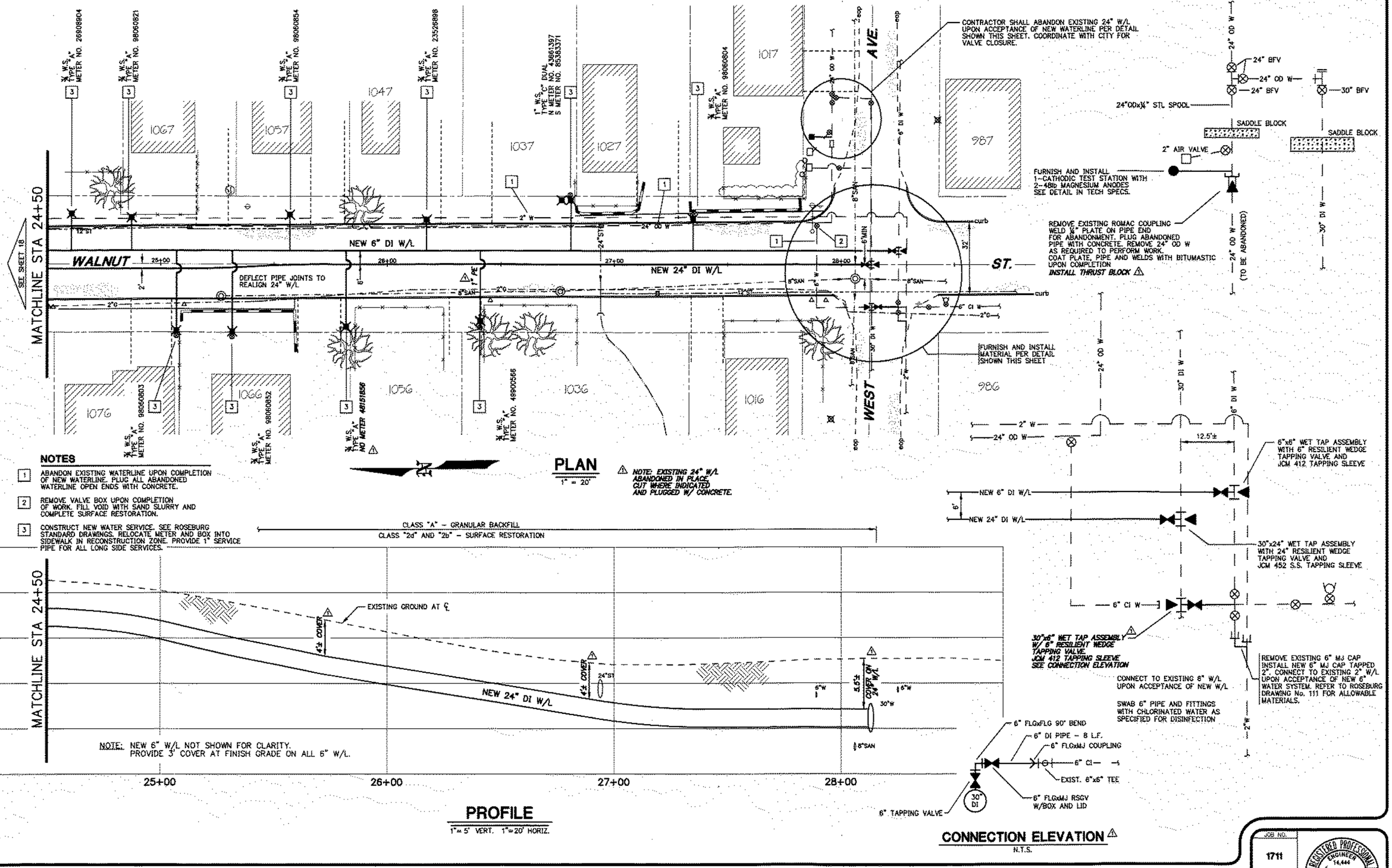
LEE ENGINEERING, INC.
CONSULTING ENGINEERS
OREGON CITY, OREGON

FILE NO. 949.07A
SHEET NO. 7A/8

5-132

87-13c 4/4

SEE SHEET 21 FOR GENERAL WATERLINE NOTES



NOTES

1. ABANDON EXISTING WATERLINE UPON COMPLETION OF NEW WATERLINE. PLUG ALL ABANDONED WATERLINE OPEN ENDS WITH CONCRETE.
2. REMOVE VALVE BOX UPON COMPLETION OF WORK. FILL VOID WITH SAND SLURRY AND COMPLETE SURFACE RESTORATION.
3. CONSTRUCT NEW WATER SERVICE. SEE ROSEBURG STANDARD DRAWINGS. RELOCATE METER AND BOX INTO SIDEWALK IN RECONSTRUCTION ZONE. PROVIDE 1" SERVICE PIPE FOR ALL LONG SIDE SERVICES.

PLAN

1" = 20'

⚠ NOTE: EXISTING 24" W/L ABANDONED IN PLACE. CUT WHERE INDICATED AND PLUGGED W/ CONCRETE.

PROFILE

1" = 5' VERT. 1" = 20' HORIZ.

CONNECTION ELEVATION ⚠

N.T.S.

DATE	NO.	REVISION	BY
APR 2000	⚠	DRAWING OF RECORD	REM

DES. JDE | DRN. JDE | CH. DAL | FILENAME: 1711D19 | SCALE: AS SHOWN | DATE: JAN 1999 | APPROVED:

PROJECT: CITY OF ROSEBURG
WALNUT/WARD/CHESTNUT IMPROVEMENTS
PROJECT NO. 96UR05

SHEET TITLE: WALNUT STREET WATERLINES
PLAN AND PROFILE
STA 24+50 TO STA 28+29

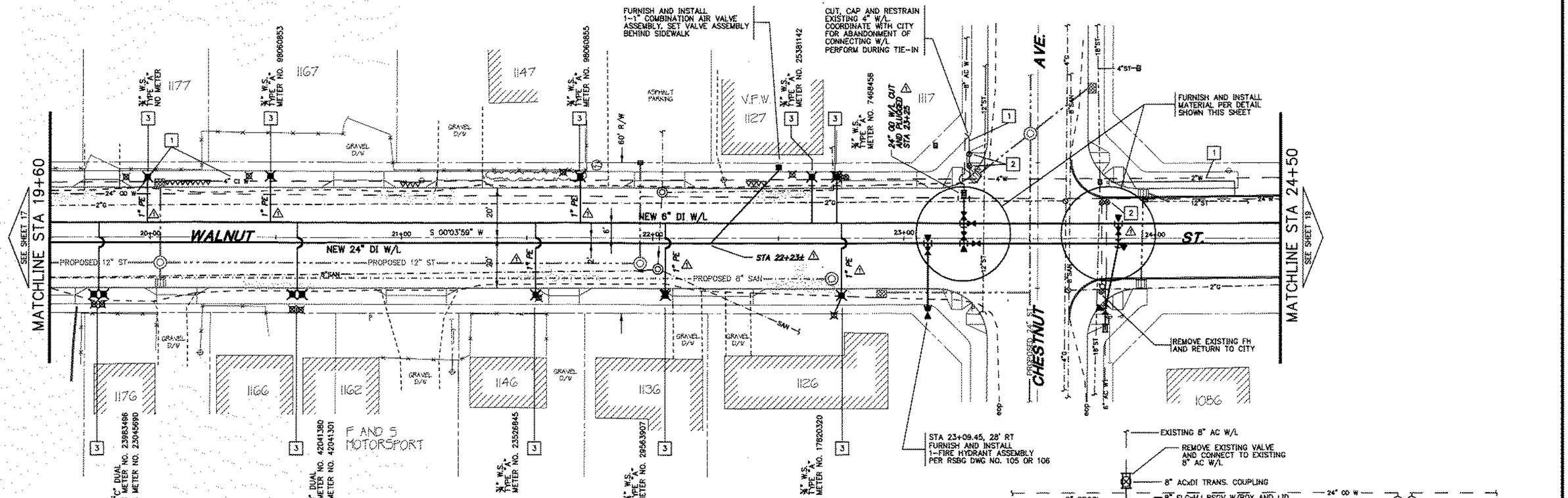
LEE ENGINEERING, INC.
CONSULTING ENGINEERS
OREGON CITY, OREGON

JOB NO. 1711
SHEET NO. 19/33

REGISTERED PROFESSIONAL ENGINEER 14,444 OREGON JULY 29, 1988 JOSEPH D. ESKEW

98WA09 12-28

SEE SHEET 21 FOR GENERAL WATERLINE NOTES



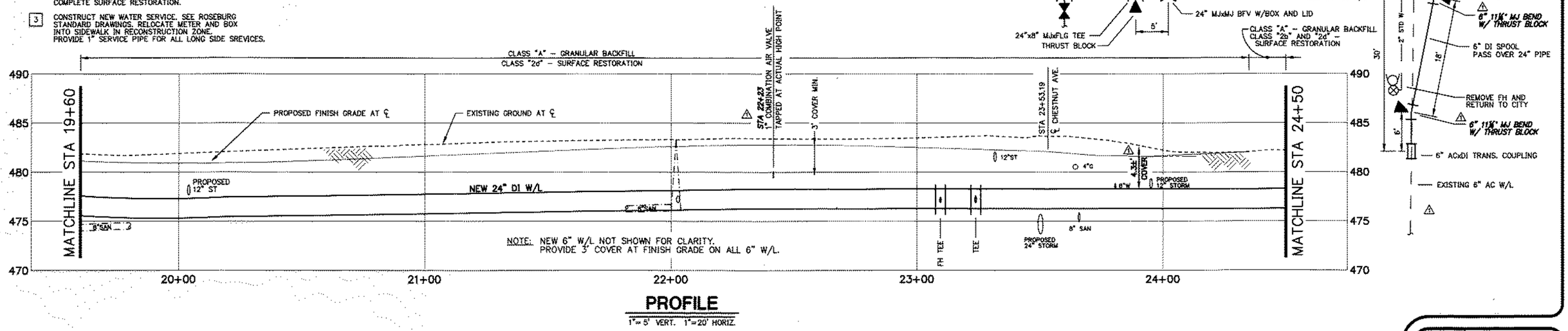
NOTES

1. ABANDON EXISTING WATERLINE UPON COMPLETION OF NEW WATERLINE. PLUG ALL ABANDONED WATERLINE OPEN ENDS WITH CONCRETE.
2. REMOVE VALVE BOX UPON COMPLETION OF WORK. FILL VOID WITH SAND SLURRY AND COMPLETE SURFACE RESTORATION.
3. CONSTRUCT NEW WATER SERVICE. SEE ROSEBURG STANDARD DRAWINGS. RELOCATE METER AND BOX INTO SIDEWALK IN RECONSTRUCTION ZONE. PROVIDE 1" SERVICE PIPE FOR ALL LONG SIDE SREVICES.

PLAN

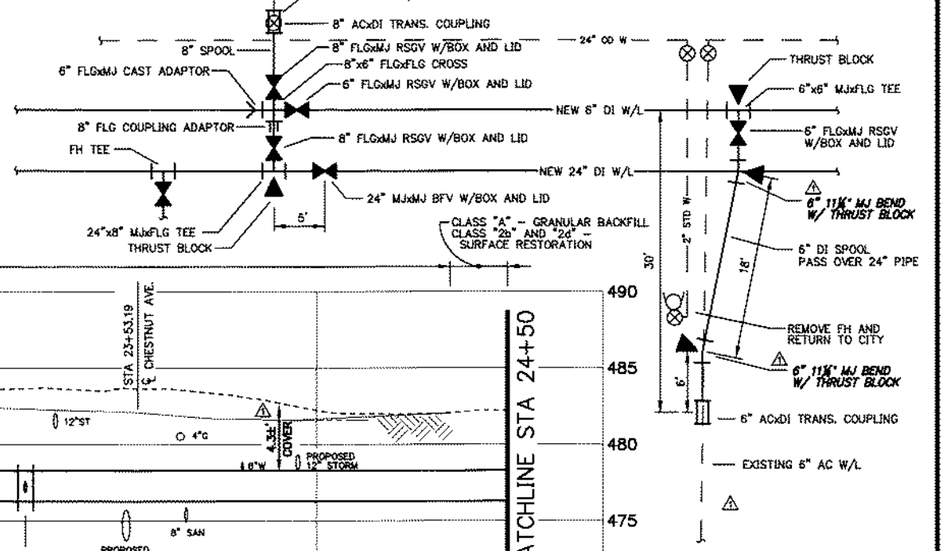
1" = 20'

⚠ NOTE: EXISTING 24" W/L ABANDONED IN PLACE CUT WHERE INDICATED AND PLUGGED W/ CONCRETE



PROFILE

1"= 5' VERT. 1"=20' HORIZ.



DATE	NO.	REVISION	BY
APR 2000	⚠	DRAWING OF RECORD	REM

DES: JDE
DRN: JDE
CH: DAL
FILENAME: 1711D18
SCALE: AS SHOWN
DATE: JAN 1999
APPROVED:

PROJECT: **CITY OF ROSEBURG**
WALNUT/WARD/CHESTNUT IMPROVEMENTS
PROJECT NO. 96UR05

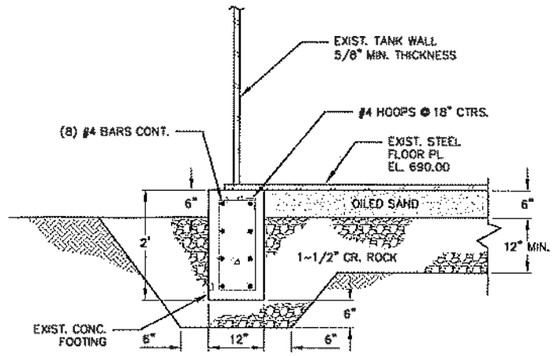
SHEET TITLE: **WALNUT STREET WATERLINES**
PLAN AND PROFILE
STA 19+60 TO STA 24+50

LEE ENGINEERING, INC.
CONSULTING ENGINEERS
OREGON CITY, OREGON

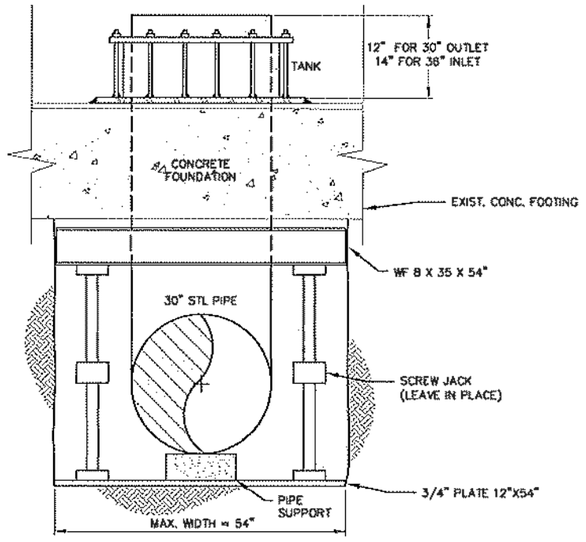
JOB NO. 1711
SHEET NO. 18
33

REGISTERED PROFESSIONAL ENGINEER 14,444 OREGON JULY 25, 1986 JOSEPH D. ESKEW EXP. 12/31/99

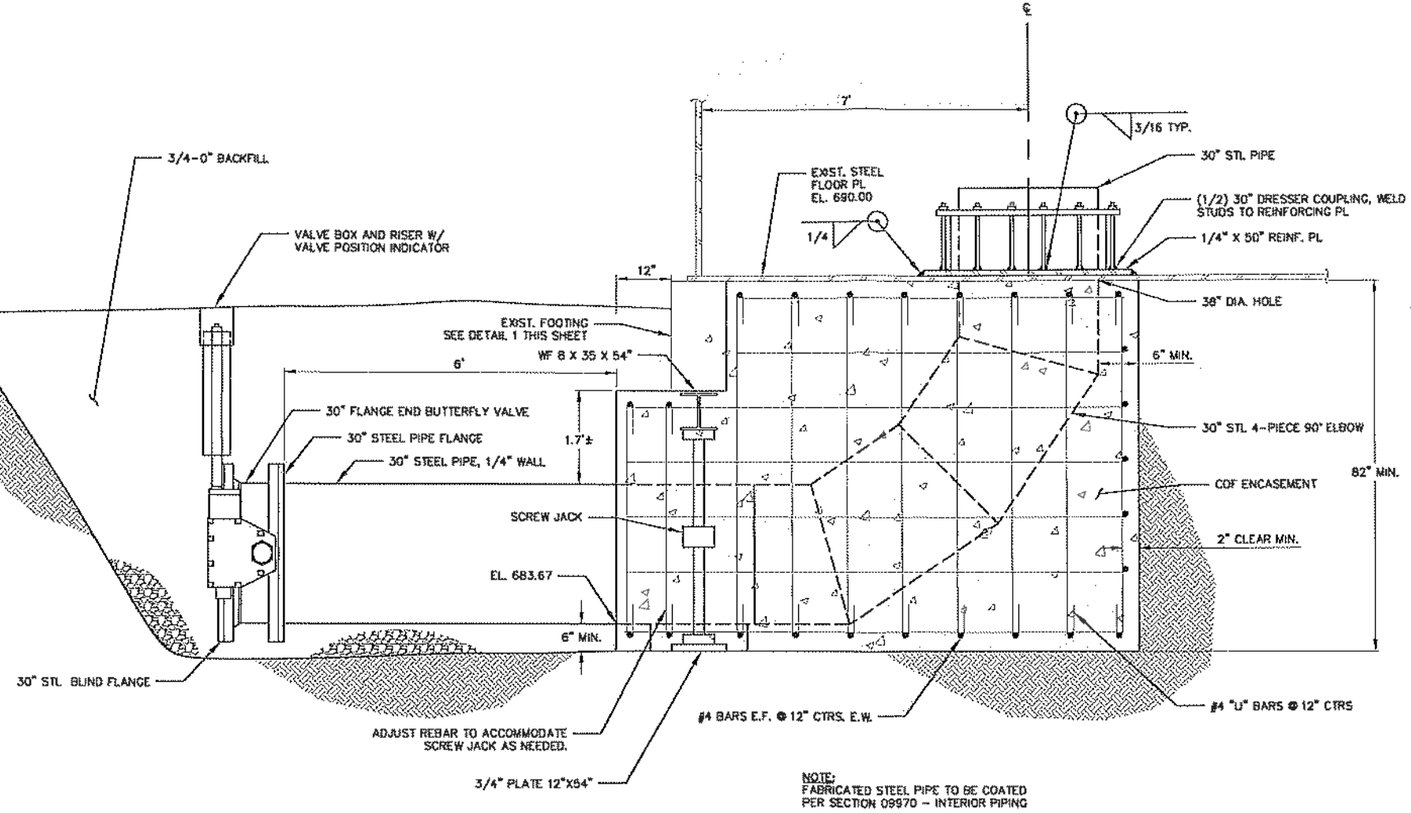
98WA09 12-28⑦



1/5 EXISTING FOOTING DETAIL
N.T.S.



3/5 TEMPORARY EXCAVATION SUPPORT DETAIL
N.T.S.



NOTE:
FABRICATED STEEL PIPE TO BE COATED
PER SECTION 09970 – INTERIOR PIPING

2/5 30" STL PIPE CONNECTION DETAIL
(SIM. 36" STL PIPE CONNECTION)
N.T.S.

REGISTERED PROFESSIONAL ENGINEER
18059
OREGON
JULY 10, 1995
BRIAN D. LEE

DESIGNED ATR						
DRAWN ATR						
CHECKED DAL						
SYM	REVISION	DATE	BY	APP'D		

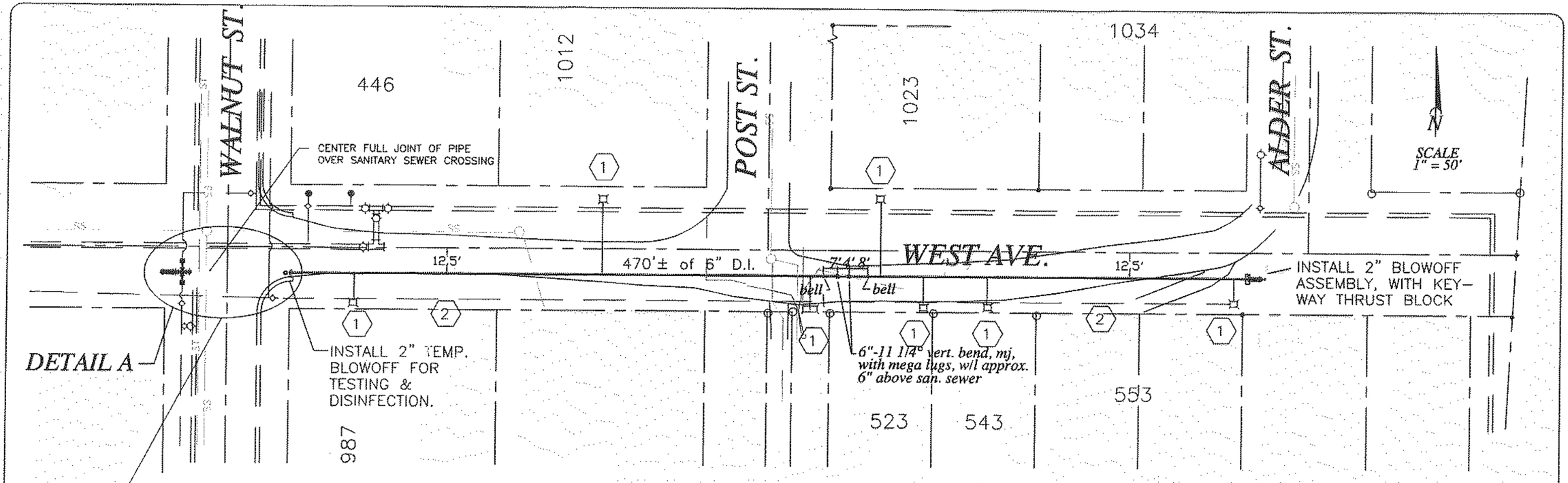
PACE
An Engineering Services Company
5000 Meadows Road, Suite 345
Lake Oswego, OR 97035
p. 503.597.3222 | f. 503.597.7655
Civil | Structural | Planning | Survey
paceengrs.com

CITY OF ROSEBURG
RESERVOIR NO. 7 RECOATING

DATE
DECEMBER 2009
SCALE:
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"

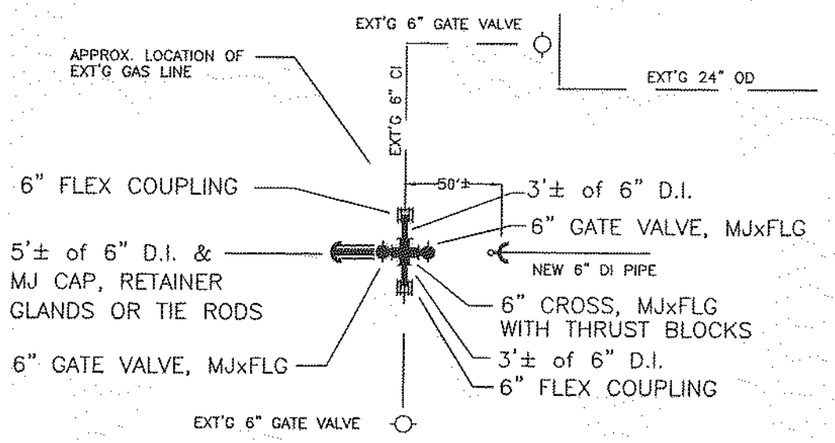
CONNECTION DETAILS

JOB NUMBER
09838
DWG NAME:
SHEET 5 OF 9

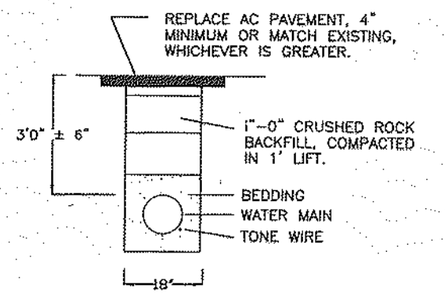


TIE-IN NOTES:

1. INSTALL 50'± OF 6" D.I. PIPE AND A FLEX COUPLING AFTER NEW 6" WATER MAIN HAS BEEN TESTED (HYDROSTATIC, BACTERIOLOGICAL & FLUSHING.
2. SWAB ALL PIPE WITH 200 MG/L CHLORINE
3. CENTER FULL JOINT OF PIPE OVER SANITARY SEWER CROSSING.



DETAIL A



TYPICAL TRENCH SECTION

(1) TIE OVER (CU OR PE) OR INSTALL NEW PE SERVICE LINE (TYPICAL).

(2) ABANDON EXISTING 1 1/2" STD. AFTER TESTING (HYDROSTATIC & BACT-ERIOLOGICAL), TIE-INS AND SERVICE TIE-OVERS.

REGISTERED PROFESSIONAL ENGINEER 11,117 OREGON JULY 17, 1977 RICHARD E. HUTTON

EXPIRES JUNE 30, 1999

ONE CALL NUMBER FOR UTILITY LOCATIONS, 1-800-332-2344 CALL 48 HRS. BEFORE YOU DIG

OCUCC CALL BEFORE YOU DIG

REVISIONS

DESIGN	DRAWN	CHK'D
PJC	PJC	REH

CITY OF ROSEBURG
WATER DEPARTMENT
WEST AVENUE MAIN REPLACEMENT
RICHARD E. HUTTON, DIRECTOR

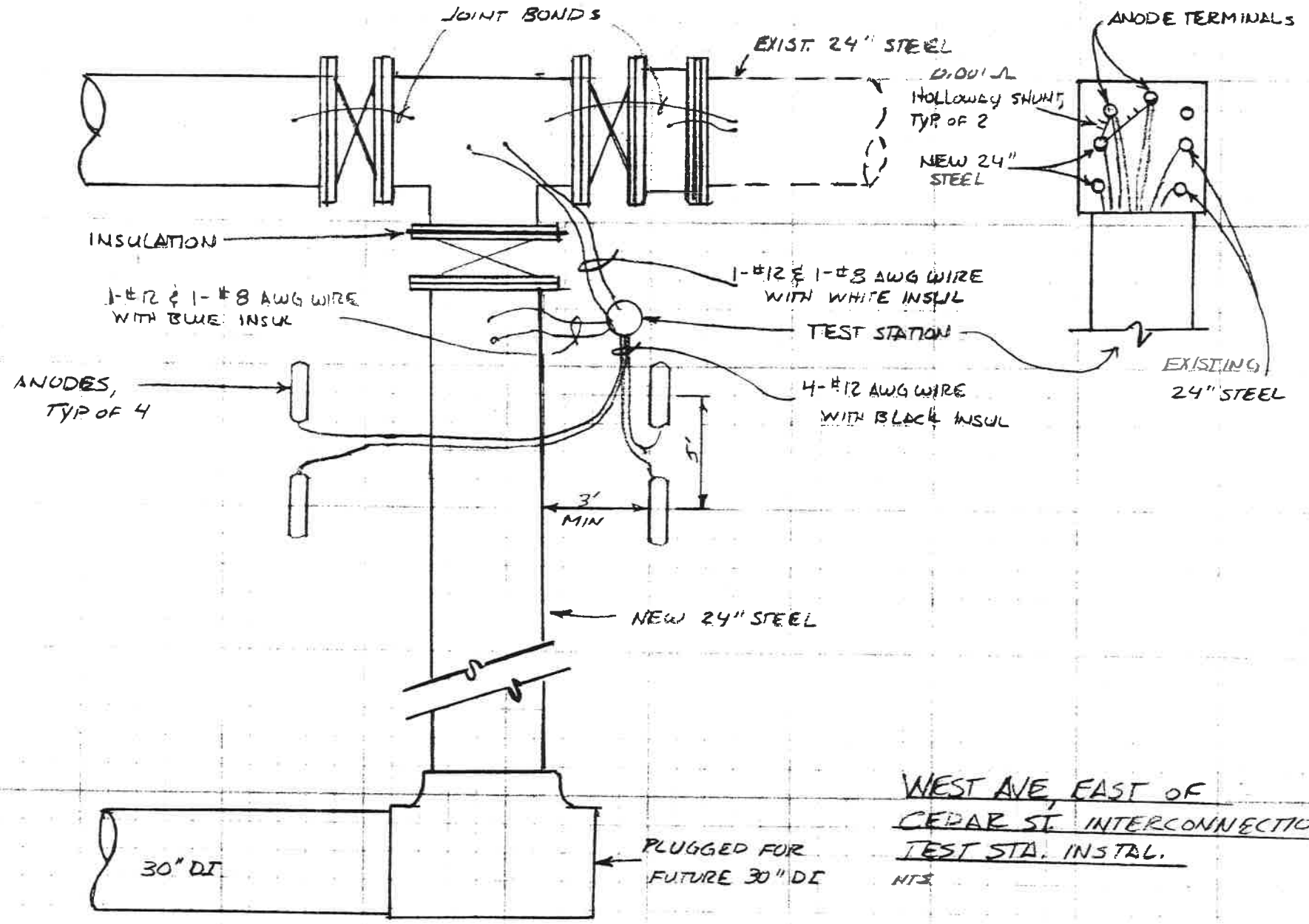
PROJECT No.	DATE	SCALE	SHT.
97wa20	11/19/97	1"=50'	1 of 1

SUBJECT _____ BY _____ DATE _____

SHEET NO. _____ OF _____

PROJECT NO. _____

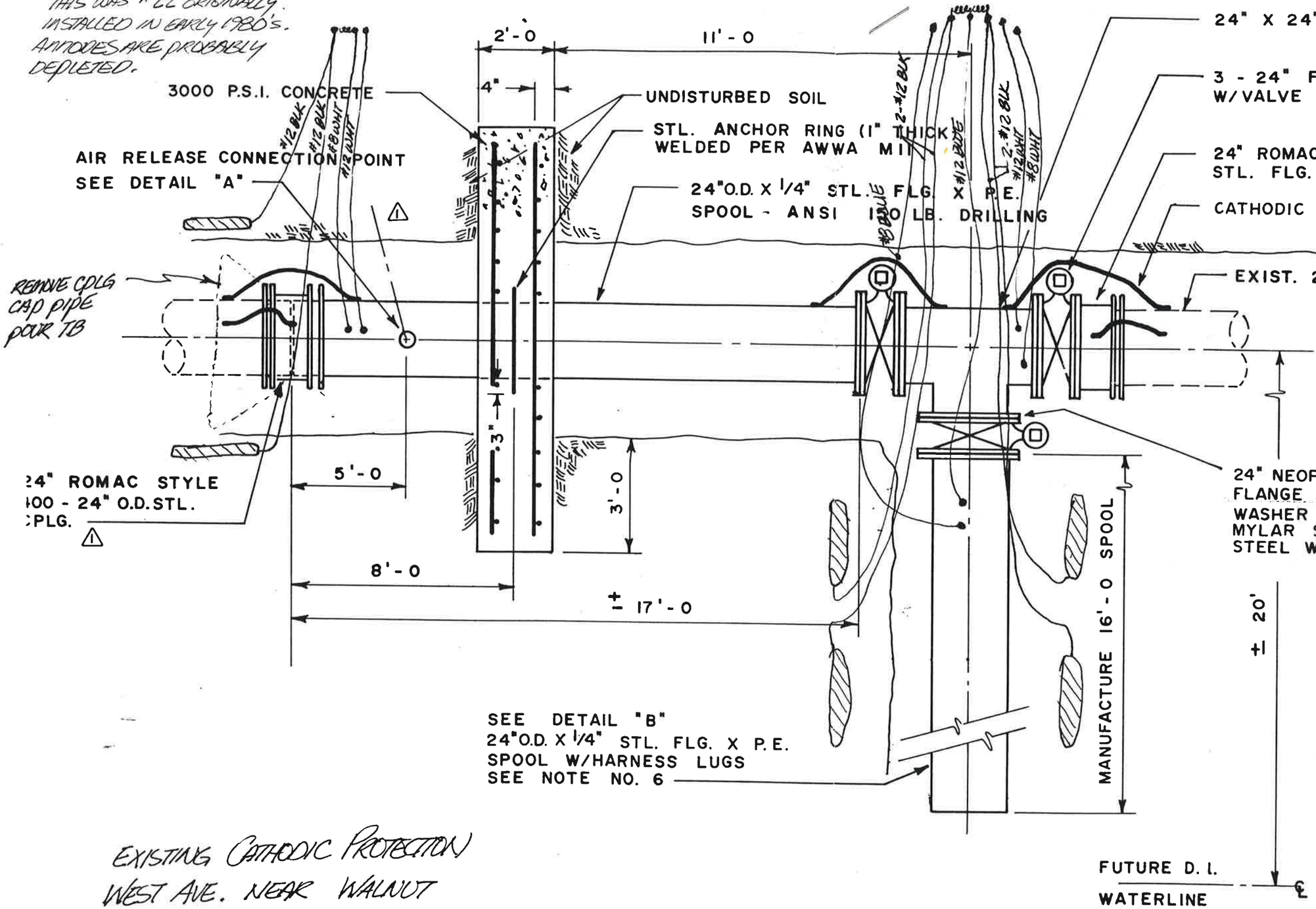
CH2M HILL



WEST AVE, EAST OF CEDAR ST. INTERCONNECTION TEST STA. INSTAL.

NTS

THIS WAS #22 ORIGINALLY INSTALLED IN EARLY 1980's. ANNODES ARE PROBABLY DEPLETED.



EXISTING CATHODIC PROTECTION
WEST AVE. NEAR WALNUT

TO DAVE WOEBE
10-18-99

PLAN

3/8" = 1'-0"

N

24

State of Oregon
Department of
Environmental
Quality

GENERAL PERMIT
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM
STORMWATER DISCHARGE PERMIT

Oregon Department of Environmental Quality
811 SW Sixth Avenue, Portland OR 97204
Telephone: (503) 229-5279 or 1-800-452-4011 (toll free in Oregon)

Issued pursuant to ORS 468B.050 and Section 402 of the Federal Clean Water Act

REGISTERED TO: File No: 126872
Permit No: 33857
City of Roseburg
900 SE Douglas Ave
Roseburg, OR 97470-3333

Date: October 3, 2020
Douglas County
EPA: ORR10G337
LLID: 1234460432680
River Mile: 10.630000000000001

Location: West Avenue Water Main Extension, NE West Avenue and NE Walnut Street to R, Roseburg

SOURCES COVERED BY THIS PERMIT:

The *legally authorized representative* (see Definitions) for construction activities (as defined below) that may discharge to surface waters or conveyance systems leading to surface waters of the state must register for coverage under this permit with DEQ before any land disturbance occurs, unless the construction activities are automatically covered as described in the 1200-CN permit.

- Construction activities including clearing, grading, excavation, materials or equipment staging and stockpiling that will disturb one or more acres and may discharge to surface waters or conveyance systems leading to surface waters of the state.
- Construction activities including clearing, grading, excavation, materials or equipment staging and stockpiling that will disturb less than one acre that are part of a common plan of development or sale if the larger common plan of development or sale will ultimately disturb one acre or more and may discharge to surface waters or conveyance systems leading to surface waters of the state.
- This permit also authorizes discharges from any other construction activity (including construction activity that disturbs less than one acre and is not part of a common plan of development or sale) designated by DEQ, where DEQ makes that designation based on the potential for contribution to an excursion of a water quality standard or for significant contribution of pollutants to waters of the state.

This permit does not authorize the following:

- In-water or riparian work, which is regulated by other programs and agencies including the Federal Clean Water Act Section 404 permit program, the Oregon Department of State Lands, the Oregon Department of Fish and Wildlife, the U.S. Fish and Wildlife Service, the U.S. Army Corp of Engineers, the National Marine Fisheries Service, and the Department of Environmental Quality Section 401 certification program.
- Post-construction stormwater discharges that originate from the site after completion of construction activities and final stabilization.
- Discharges to underground injection control (UIC) systems.

Lydia Emer, Operations Administrator

Effective: December 15, 2015
Expiration Date: December 14, 2020

PERMITTED ACTIVITIES

Until this permit expires, is modified or revoked, the permit registrant is authorized to construct, install, modify, or operate erosion and sediment control measures and stormwater treatment and control facilities, and to discharge stormwater and certain specified non-stormwater discharges to surface waters of the state or conveyance systems leading to surface waters of the state only in conformance with all the requirements, limitations, and conditions set forth in the permit including attached schedules as follows:

Unless specifically authorized by this permit, by regulation issued by EPA, by another NPDES permit, or by Oregon Administrative Rule, any other direct or indirect discharge to waters of the state is prohibited, including discharges to an underground injection control system.

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SCHEDULE A
CONTROLS AND LIMITATIONS

CONSTRUCTION ACTIVITIES REQUIRED TO REGISTER FOR PERMIT

1. Registering New Construction Activities

a. Applicants seeking registration for coverage under this permit for construction activities that will disturb one or more acres must submit a complete application to DEQ or Agent at least thirty (30) calendar days before the planned land disturbance, unless otherwise approved by DEQ or Agent (see Schedule **D** for description of Agent). The application must include:

i. One paper copy and one electronic copy of the following:
(1) A complete DEQ-approved application form;
(2) An Erosion and Sediment Control Plan (ESCP);
(3) A Land Use Compatibility Statement (LUCS) indicating that the proposed activities are compatible with the local government's acknowledged comprehensive plan; and

ii. Applicable permit fees.

b. Applicants seeking registration for coverage under this permit for construction activities that will disturb less than one acre that are part of a larger common plan of development or sale must, at least thirty (30) calendar days before the planned land disturbance, submit to DEQ or Agent:

i. A complete DEQ-approved application form;

ii. One copy of an ESCP that covers the individual lot(s); and

iii. Applicable permit fees.

c. Applicants seeking registration for coverage under this permit for construction activities that disturb or are likely to disturb five (5) or more acres over the life of the project, are subject to a 14-calendar day public review period before permit registration is granted. The public review period will not begin if the application form or ESCP are incomplete.

d. DEQ or Agent will notify the applicant in writing if registration is approved or denied. Permit coverage does not begin until the applicant receives written notice that the registration is approved. If registration is denied or the applicant does not wish to be regulated by this permit, the applicant may apply for an individual permit in accordance with OAR 340-045-0030.

e. Until termination has been approved by DEQ or Agent, permit registrants for permitted activities that disturb one acre or more must pay an annual fee.

f. Permitted activities for projects that disturb less than one acre and utilize the small lot fee structure are covered under the permit for 2 (two) years. To continue coverage beyond 2 years, the permit registrant must submit a DEQ-approved application form and (if needed) an updated ESCP; and pay the applicable permit fee.

2. Renewal Application for Permit Coverage

a. An owner or operator of construction activities registered under the 1200-C permit that expires in 2015 must submit to DEQ or Agent a complete renewal application, using a DEQ-approved renewal application form before expiration of the 1200-C permit to ensure uninterrupted permit coverage for construction stormwater discharges.

b. If renewal is denied or the applicant does not wish to be regulated by this permit, the registrant may apply for an individual permit in accordance with OAR 340-045-0030.

3. Transfer of Permit Registration

a. To transfer permit registration, the new owner or permit registrant must submit a DEQ-approved transfer form and applicable fees prior to permit expiration and within thirty (30) calendar days of the planned transfer.
b. If ownership changes (through sale, foreclosure or other means) and the previous owner cannot be found:
    i. The new owner must register for coverage under the permit (Schedule A, Paragraph 1) if the site is not stabilized.
    ii. The new owner must register for coverage under the permit (Schedule A, Paragraph 1) prior to any additional land disturbance.
    iii. The new owner does not need to register for coverage under the permit if the site meets the conditions for termination (see Schedule B) and there is no ongoing or additional land disturbance planned.
    iv. DEQ will attempt to contact the previous owner at the address on record. If there is no response, after sixty (60) calendar days DEQ may terminate the previous owner's permit coverage.

4. Authorized Stormwater Discharges

Subject to compliance with the terms and conditions of this permit, and provided that all necessary controls are implemented to minimize sediment transport, the following stormwater discharges from construction sites are authorized (unless otherwise prohibited by local ordinances):

a. Stormwater associated with construction activity described in the "Sources Covered" section of the permit.
b. Stormwater from support activities at the construction site (for example, concrete or asphalt operations, equipment staging yards, material storage areas, excavated material disposal areas and borrow areas) provided:
    i. The support activity is directly related to the construction site covered by this NPDES permit;
    ii. The support activity is not a commercial operation serving multiple unrelated construction projects by different permit registrants;
    iii. The support activity does not operate beyond the completion of the construction activity at the last construction project it supports; and
    iv. Appropriate control measures are used to ensure compliance with discharge and water quality requirements.

5. Authorized Non-Stormwater Discharges

If the terms and conditions of this permit are met, all necessary controls are implemented to minimize sediment transport, the discharge is not contaminated, and the discharge is not prohibited by local ordinance, the following non-stormwater discharges from construction sites are authorized:

a. Water from emergency firefighting activities;
b. Fire hydrant flushings;
c. Potable water including water line flushing;
d. Vehicle washing and external building washing that does not use solvents, detergents or hot water;
e. Pavement wash waters where stockpiled material, spills or leaks of toxic or hazardous materials have not occurred (unless all stockpiled and spilled material has been removed) and where solvents, detergents or hot water are not used. Directing pavement wash waters into any surface water, storm drain inlet, or stormwater conveyance is prohibited, unless the conveyance is connected to a sediment basin, sediment trap, or similarly effective control;
f. Water used to control dust;

g. Air conditioning or compressor condensate;
h. Construction dewatering activities (including groundwater dewatering and well drilling discharge associated with the registered construction activity), provided that:
   i. The water is land applied in a way that results in complete infiltration with no potential to discharge to a surface water of the state, or
   ii. Best Management Practices (BMPs) or a treatment system approved by DEQ or Agent is used to ensure compliance with discharge and water quality requirements (see 9.d);
i. Foundation or footing drains where flows are not contaminated with process materials such as solvents; and
j. Landscape irrigation.

For other non-stormwater discharges, a separate permit may be needed. The disposal of wastes to surface waters or on-site is not authorized by this permit.

6. Prohibited Discharges

Discharges of the following are not authorized by this permit:
a. Wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds and other construction materials;
b. Fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance;
c. Soaps or solvents used in vehicle and equipment washing.
d. Concrete truck wash-out, hydro-demolition water, and saw-cutting slurry.

7. Control Measures

It is the responsibility of the permit registrant to implement BMPs as needed for weather conditions.

a. Erosion Prevention
   The permit registrant must control stormwater volume and velocity within the site to minimize soil erosion. The permit registrant must prevent or minimize the disturbance of sediment.
   i. Avoid or minimize excavation and bare ground activities during wet weather.
   ii. Temporarily stabilize soils at the end of the shift before holidays and weekends, if needed. It is the permit registrant's responsibility to ensure that soils are stable during rain events at all times of the year.
   iii. Clearing and Grading.
      Phase clearing and grading to the maximum extent practical to prevent exposed inactive areas from becoming sources of erosion. Minimize the disturbance of steep slopes. Minimize erosion during and after soil disturbance using BMPs such as temporary seeding and planting, final vegetative cover, mulches, compost blankets, erosion control blankets and mats, and soil tackifiers.
   iv. Wind Erosion/Dust Control. Water or use a soil-binding agent or other dust control technique as needed to avoid wind-blown soil.
   v. Vegetative Erosion Control.
      (1) Preserve existing vegetation and re-vegetate open areas when practical.
      (2) Do not remove temporary sediment control practices until final vegetative cover or permanent stabilization measures are established.
      (3) Identify the type of seed mix (percentages of the various seeds of annuals, perennials and clover) and other plantings used to establish temporary or final vegetative cover.

b. Natural Buffer Zone
   i. If a water of the state is within the project site or within 50 feet of the project boundary, and a natural buffer exists within 50 feet of the water of the state,
      (1) The permit registrant must:
         (a) Maintain any existing natural buffer within the 50-foot zone for the duration of permit coverage; or
         (b) Maintain less than the entire existing natural buffer, and provide additional erosion and sediment controls (beyond those required in other sections of this general permit). In addition to other applicable requirements of this permit, the permit registrant must implement one or more of the BMPs listed below to control and treat sediment and turbidity. The selected BMP(s) must be identified in the ESCP as addressing this condition of the permit, and the rationale for choosing the selected BMP(s) must also be provided.
            (i) Compost berms, compost blankets, or compost socks;
            (ii) Erosion control mats;
            (iii) Tackifiers used in combination with perimeter sediment control BMPs;
            (iv) Water treatment by electro-coagulation, flocculation, or filtration; and/or
            (v) Other substantially equivalent sediment or turbidity BMP approved by DEQ or Agent.
      (2) In addition, the permit registrant must:
         (a) Ensure that all discharges from covered activities to the water of the state are treated by the site's erosion and sediment controls before entering the natural buffer. Use velocity dissipation devices if necessary to prevent erosion in the natural buffer.
         (b) Delineate and clearly mark off (with flags, tape or similar marking devices) all natural buffer zones.
   ii. Stormwater control features (for example, stormwater conveyance channels, storm drain inlets, and sediment basins) are not "waters of the state" for the purposes of triggering this requirement.
   iii. Areas that the permit registrant does not own or that are otherwise outside the permit registrant's operational control may be considered areas of undisturbed natural buffer for purposes of this requirement. However, the permit registrant is only required to retain and protect from construction activities the portion of the buffer area that is under the permit registrant's control.
   iv. The Natural Buffer Zone requirements do not apply if:
      (1) No natural buffer exists due to development that occurred prior to the initiation of planning for the current project; or
      (2) There is no discharge of stormwater to the water of the state through the area between the disturbed portions of the site and the surface water located within the project site or within 50 feet of the site. This includes situations where the permit registrant has implemented control measures, such as a berm or other barrier, that will prevent such discharges; or
      (3) There is a CWA Section 404 permit and 401 WQC issued for the project; or
      (4) Construction is for a water-dependent structure or water access areas (for example, pier, boat ramp, or trail).
   v. Pre-existing conditions
      (1) The permit registrant is not required to enhance the quality of the vegetation that already exists in the buffer, or provide vegetation if none exists.
      (2) Any preexisting structures or impervious surfaces are allowed in the natural buffer provided the permit registrant retains and protects from disturbance any natural buffer area outside the preexisting disturbance.

c. Runoff Control
The permit registrant must control stormwater discharges, including both peak flow rates and total stormwater volume, to minimize erosion at outlets and to minimize downstream channel and streambank erosion. The permit registrant must minimize sediment discharges from the site. The permit registrant must prevent or minimize scouring by means such as diverting, collecting, conveying or controlling flow. BMPs used for these purposes include diversion of run-on; trench drains, slope drains, french drains and subsurface drains; temporary diversion dikes; earthen berms; grass-lined or armored channels (such as turf reinforcement mats); drainage swales; energy dissipaters; rock outlet protection; drop inlets; and check dams. Note that any underground injection must comply with OAR Chapter 340, Division 44.

d. Sediment Control
The permit registrant must prevent or minimize sediment transport by means such as filtration and settling.
   i. Control sediment as needed along the site perimeter and at all operational internal storm drain inlets at all times during construction, both internally and at the site boundary by using BMPs such as sediment fences, buffer zones, sediment traps, rock filters, compost berms/compost socks, fiber wattles, storm drain inlet protection, and temporary or permanent sedimentation basins; and, when discharging from basins and impoundments, by utilizing outlet structures that withdraw water from the surface, unless infeasible.
   ii. Sediment Tracking and Transport Control.
   The permit registrant must prevent or minimize tracking of sediment onto public or private roads using BMPs such as:
      (1) Establish graveled (or paved) exits and parking areas prior to any land disturbing activities.
      (2) Gravel all unpaved roads located onsite.
      (3) Use an exit tire wash.
      (4) Cover all sediment loads leaving the site.
      (5) When trucking saturated soils from the site, either use water-tight trucks or drain loads on site.

e. Pollution Prevention and Control.
   i. Pollution Prevention.
   The permit registrant must design, implement, and maintain pollution prevention measures to minimize the exposure of building materials, building products, construction wastes, trash, landscape materials, fertilizers, pesticides, herbicides, detergents, sanitary waste and other materials present on the site to precipitation and to stormwater.
      (1) Use BMPs to prevent or minimize pollution of stormwater or to treat flow from dewatering, ponded water, paving, and temporary bridges.
      (2) Use BMPs to prevent or minimize stormwater from being exposed to pollutants from spills; vehicle and equipment fueling, maintenance, and storage; other cleaning and maintenance activities; and waste handling activities. These pollutants include fuel, hydraulic fluid and other oils from vehicles and machinery; as well as debris, fertilizer, pesticides and herbicides, paints, solvents, curing compounds and adhesives.
   ii. Stockpile Erosion and Sediment Control Practices.
      (1) Both on-site stockpiles and stockpiles located away from the construction activity but still under the control of the permit registrant must be protected to prevent significant amounts of sediment or turbid water from discharging to surface waters or conveyance systems leading to surface waters.
      (2) As needed based on weather conditions, at the end of each workday soil stockpiles must be stabilized or covered, or other BMPs must be implemented to prevent discharges to surface waters or conveyance systems leading to surface waters.

(3) In developing these practices, at a minimum the following must be considered: diversion of uncontaminated flows around stockpiles, use of cover over stockpiles, and installation of sediment fences (or other barriers that will prevent the discharge of sediment or turbidity) around stockpiles.

iii. Solid Waste and Hazardous Materials Management.
Implement the following BMPs when applicable: written spill prevention and response procedures, employee training on spill prevention and proper disposal procedures, spill kits available on site, regular maintenance schedule for vehicles and machinery, material delivery and storage controls, training and signage, and covered storage areas for waste and supplies.

f. Additional BMP Requirements During Inactive Periods.
   i. If all construction activities cease at the site for thirty (30) calendar days or more, the entire site must be stabilized using temporary seeding, vegetation, a heavy mulch layer, or another method.
   ii. On any significant portion of the site, if construction activities cease for fourteen (14) calendar days or more, install temporary covering such as blown straw and a tackifier, loose straw, compost mulch, temporary vegetative cover, crushed rock or gravel base.

8. Implementation of Control Measures

a. Permit registrants must implement the ESCP (Paragraph A.12). Failure to implement any of the control measures or practices described in the ESCP is a violation of the permit.
b. Permit registrants must prevent the discharge of significant amounts of sediment to surface waters or conveyance systems leading to surface waters. The following conditions indicate that a significant amount of sediment has left or is likely to leave the site, and are prohibited:
   i. Earth slides or mud flows;
   ii. Concentrated flows of stormwater such as rills, rivulets or channels that cause erosion when such flows are not filtered, settled or otherwise treated to remove sediment;
   iii. Sediment laden or turbid flows of stormwater that are not filtered or settled to remove sediments and turbidity;
   iv. Deposits of sediment at the construction site in areas that drain to unprotected stormwater inlets or to catch basins that discharge to surface waters. Inlets and catch basins with failing sediment controls due to lack of maintenance or inadequate design are considered unprotected;
   v. Deposits of sediment from the construction site on any property (including public and private streets) outside of the construction activity covered by this permit.
c. Permit registrants must ensure the control measures or practices described in the ESCP are implemented according to the following sequence:
   i. Before Construction.
      (1) Identify, mark, and protect (with construction fencing or other means) critical riparian areas and vegetation including important trees and associated rooting zones and vegetation areas to be preserved.
      (2) Identify, mark and protect vegetative buffer zones between the site and sensitive areas (for example, wetlands), and other areas to be preserved, especially in perimeter areas.
      (3) Hold a pre-construction meeting of project construction personnel that includes the inspector required by condition A.12.b.iii to discuss erosion and sediment control measures and construction limits.
      (4) Stabilize site entrances and access roads including, but not limited to construction entrances, roadways and equipment parking areas.
      (5) Install perimeter sediment control, including storm drain inlet protection as well as all sediment basins, traps, and barriers.

(6) For projects involving concrete, permit registrants must establish concrete truck and other concrete equipment washout areas before beginning concrete work.
(7) Establish material and waste storage areas, and other non-stormwater controls.
(8) Stabilize stream banks and construct the primary runoff control measures to protect areas from concentrated flows.

ii. During Construction.
(1) Land Clearing, Grading and Roadways. Permit registrants must:
(a) Begin land clearing, excavation, trenching, cutting or grading only after installing applicable sediment and runoff control measures.
(b) Provide appropriate erosion and sediment control BMPs for all roadways including gravel roadways.
(c) Install additional control measures as work progresses as needed.
(d) Phase clearing and grading to the maximum extent practical to prevent exposed inactive areas from becoming a source of erosion.
(2) For projects involving concrete, permit registrants must:
(a) Wash concrete trucks and equipment off site (in an appropriately protected area) or in designated concrete washout areas only.
(b) Direct all wash water into a pit or leak-proof container. The pit does not need to be lined or leak-proof, but the pit or container must be designed so that no overflows can occur due to inadequate sizing or precipitation. Concrete wash water must not adversely affect groundwater.
(c) Handle (for example, through disposal, reuse or recycling) wash water as waste. Do not dispose of concrete wash water or wash out concrete trucks onto the ground, or into storm drains, open ditches, streets, or streams.
(d) Do not dump excess concrete on site, except in designated concrete washout areas.
(e) Handle (for example, through disposal, reuse or recycling) hardened concrete waste consistent with handling of other construction wastes.
(f) Concrete spillage or concrete discharge to surface waters of the state is prohibited.
(3) Surface Stabilization. Permit registrants must:
Apply temporary stabilization measures (for example, mulching or temporary seeding), final vegetative cover, or permanent stabilization measures immediately on all disturbed areas as work is completed. Stabilization of disturbed areas must be initiated immediately whenever any earth disturbing activities have permanently ceased on any portion of the site. However, temporary or permanent stabilization measures are not required for areas that are intended to be left unvegetated or unstabilized following construction (such as dirt access roads, utility pole pads, areas being used for storage of vehicles, equipment, or materials), provided that measures are in place to eliminate or minimize erosion.

iii. Termination. Before termination of permit coverage, permit registrants must:
(1) Provide final vegetative cover or permanent stabilization measures on all exposed areas (see Section D.3).
(2) Immediately after seeding or planting the area to be vegetatively stabilized, the permit registrant must select, design, and install non-vegetative erosion controls (such as mulch or rolled erosion control products) that provide cover to the area while vegetation is becoming established, to the extent necessary to prevent erosion of the seeded or planted area.
(3) Remove and properly dispose of construction materials and waste, including sediment retained by temporary BMPs.
(4) Remove all temporary control measures as areas are stabilized, unless doing so conflicts with local requirements.

9. BMP Maintenance

a. The permit registrant must establish and promptly implement procedures for maintenance and repair of erosion and sediment control measures.
b. General Site Maintenance.
   i. Significant amounts of sediment that leave the site must be cleaned up within 24 hours, placed back on the site and stabilized, or disposed of properly. In addition, the source(s) of the sediment must be controlled to prevent continued discharge within 24 hours. Any in-stream cleanup of sediment must be performed according to requirements and timelines set by the Oregon Department of State Lands.
   ii. Sediment must not be intentionally washed into storm sewers or drainage ways. Methods such as vacuuming, dry mechanical sweeping, or manual sweeping must be used to cleanup released sediments.
   iii. Fertilizer application rates must follow manufacturer's guidelines and the application must be done in such a way to minimize discharge of nutrients to surface waters.
c. Maintenance of Erosion and Sediment Controls. Permit registrants must:
   i. Sediment fence: remove trapped sediment before it reaches one third of the above ground fence height.
   ii. Other sediment barriers (such as biobags): remove sediment before it reaches two inches depth above ground height.
   iii. Catch basins: clean before sediment retention capacity has been reduced by fifty percent.
   iv. Sediment basins: remove trapped sediments before design capacity has been reduced by fifty percent.
d. Treatment Systems.
   If an active treatment system (for example, electro-coagulation, flocculation, filtration, etc.) for sediment or other pollutant removal is employed, the permit registrant must submit an operation and maintenance plan (including system schematic, location of system, location of inlet, location of discharge, discharge dispersion device design, and a sampling plan and frequency) to DEQ or Agent before operating the treatment system. The plan must be approved by DEQ or Agent before operating the treatment system. If approved, the treatment system must be operated and maintained according to manufacturer's specifications.

10. In-stream Water Quality Standards

a. The permit registrant must not cause or contribute to a violation of in-stream water quality standards.
b. In the absence of information demonstrating otherwise, DEQ expects that compliance with the conditions in this permit will result in stormwater discharges being controlled as necessary to meet applicable water quality standards. If at any time the permit registrant becomes aware, or DEQ determines, that a discharge from the permitted activity is not being controlled as necessary to meet applicable water quality standards, the permit registrant must take corrective actions, and document the corrective actions as required in A.13.

11. Water Quality Requirements for TMDL and 303(d) Listed Waterbodies

In addition to other applicable requirements of this permit, if a permit registrant's construction project has the potential to discharge to a portion of a waterbody that is listed as impaired and requiring a TMDL for turbidity or sedimentation on the most recently EPA-approved Oregon 303(d) list or that has an established Total Maximum Daily Load (TMDL) for sedimentation or turbidity (available at www.deq.state.or.us/WQ/assessment/assessment.htm), the permit registrant must implement one or more of the BMPs listed below to control and treat sediment and turbidity. The selected BMP(s) must

be identified in the ESCP as addressing this condition of the permit, and the rationale for choosing the selected BMP(s) must also be provided.

a. Compost berms, compost blankets, or compost socks;
b. Erosion control mats;
c. Tackifiers used in combination with perimeter sediment control BMPs;
d. Established vegetated buffers sized at 50 feet (horizontally) plus an additional 25 feet (horizontally) per 5 degrees of slope;
e. Water treatment by electro-coagulation, flocculation, or filtration; and/or
f. Other substantially equivalent sediment or turbidity BMP approved by DEQ or Agent.

12. Erosion and Sediment Control Plan (ESCP)

a. Preparation.
   i. The permit registrant must ensure that an ESCP is prepared and revised as necessary to reflect site conditions for the construction activity regulated by this permit, and submit revisions to DEQ or Agent in accordance with requirements of this permit. The design, installation, and maintenance of erosion and sediment controls must be adequate to address factors such as the amount, frequency, intensity, and duration of precipitation, the nature of resulting stormwater runoff, and soil characteristics, including the range of soil particle sizes expected to be present on the site.
   ii. Qualifications to Prepare ESCP.
      (1) For construction activities disturbing 20 or more acres, the ESCP must be prepared and stamped by a Certified Professional in Erosion and Sediment Control, Certified Professional in Storm Water Quality, Oregon Registered Professional Engineer, Oregon Registered Landscape Architect, or Oregon Certified Engineering Geologist.
      (2) If engineered facilities such as sedimentation basins or diversion structures for erosion and sediment control are required, the ESCP must be prepared and stamped by an Oregon Registered Professional Engineer.
b. The ESCP must include the following elements:
   i. Name of the site.
   ii. Local Government Requirements. Include any procedures necessary to meet applicable local government erosion and sediment control or stormwater management requirements.
   iii. Erosion and Sediment Control Inspector.
      (1) Inspections must be conducted by a person knowledgeable in the principles and practice of erosion and sediment controls who possesses the skills to assess conditions at the construction site that could impact stormwater quality, is knowledgeable in the correct installation of the erosion and sediment controls, and is able to assess the effectiveness of any sediment and erosion control measures selected to control the quality of stormwater discharges from the construction activity.
      (2) Beginning January 1, 2017, for projects that are five or more acres, inspections must be conducted by a person certified in an erosion and sediment control program that has been approved by DEQ. DEQ has approved the following programs:
         (a) Certified Professional in Erosion and Sediment Control,
         (b) Certified Professional in Storm Water Quality,
         (c) Washington State Certified Erosion and Sediment Control Lead, or
         (d) Rogue Valley Sewer Services Erosion and Sediment Control Certification.

(3) Inspections must be conducted by the Erosion and Sediment Control Inspector identified in the ESCP.
(4) Provide the following for all personnel that will conduct inspections:
(a) Name and title;
(b) Contact phone number and, if available, e-mail address; and
(c) Description of experience and training.

iv. Narrative Site Description.
(1) Description of the construction activity;
(2) Proposed timetable indicating when each erosion and sediment control BMP is to be installed and the duration that it is to remain in place;
(3) Estimates of the total area of the permitted site and the area of the site that is expected to undergo clearing, grading or excavation;
(4) Nature of the fill material to be used, and of the site soils prior to disturbance;
(5) Names of the receiving water(s) for stormwater runoff;
(6) The types of pollutants that could be found in stormwater and their likely sources;
(7) Any authorized non-stormwater discharges; and
(8) If a surface water of the state is within 50 feet of the permitted activities,
(a) Description of area within 50 feet of project site (including any natural buffer), and
(b) Description of approach to manage the natural buffer zone, if any (for example, maintain natural buffer, reduce natural buffer and increase BMPs, or eliminate flow through natural buffer).

v. Site Map and Drawings.
(1) The site map and drawings must be kept on site and must represent the actual BMP controls being used onsite;
(2) The site map must show sufficient roads and features for DEQ or Agent to locate and access the site;
(3) The site map and drawings must include (but is not limited to) the following features (as applicable):
(a) Total property boundary including surface area of the development;
(b) Areas of soil disturbance (including, but not limited to, showing cut and fill areas and pre- and post-development elevation contours);
(c) Drainage patterns before and after finish grading;
(d) Discharge points;
(e) Areas used for the storage of soils or wastes;
(f) Areas where vegetative practices are to be implemented;
(g) All erosion and sediment control measures or structures;
(h) Impervious structures after construction is completed (including buildings, roads, parking lots and outdoor storage areas);
(i) Springs, wetlands and other surface waters on site or adjacent to the site;
(j) Temporary and permanent stormwater conveyance systems;
(k) Onsite water disposal locations (for example, for dewatering);
(l) Storm drain catch basins depicting inlet protection, and a description of the type of catch basins used (for example, field inlet, curb inlet, grated drain and combination);
(m) Septic drain fields;
(n) Existing or proposed drywells or other UICs;
(o) Drinking water wells on site or adjacent to the site;
(p) Planters;
(q) Sediment and erosion controls including installation techniques;

(r) Natural buffer zones and any associated BMPs for all areas within 50 feet of a water of the state; and
(s) Detention ponds, storm drain piping, inflow and outflow details.

c. ESCP Revisions
   i. The ESCP must be accurate and reflect site conditions. Update the ESCP as needed to represent actual BMPs being used onsite.
   ii. ESCP revisions must:
      (1) Clearly identify any changes (such as type or design) to the BMPs identified in the ESCP, their location, maintenance required, and any other revisions necessary to prevent and control erosion and sediment runoff.
      (2) Include contact information and any applicable certification, training and experience for changes in Erosion and Sediment Control Inspector.
   iii. Approval of the revisions by DEQ or Agent prior to implementation is not required.
   iv. Submission of all ESCP revisions is not required. ESCP revisions must be submitted only if they are made for any of the following reasons:
      (1) Part of a Corrective Action (A.13).
      (2) Change in address of the permit registrant. Registrant must keep their address current with DEQ or Agent. Failure to do so may be used as grounds for termination of coverage.
      (3) Change (increase or decrease) in the size of the project.
      (4) Change (increase or decrease) in the size or location of disturbed areas.
      (5) Change to BMPs (for example, type, design or location).
      (6) Change in erosion and sediment control inspector.
   v. If submission of ESCP revisions is required, submit one paper copy and one electronic PDF to DEQ or Agent within 10 calendar days of the revision. These revisions should be submitted as revised pages of the ESCP or drawings only; it is not necessary to submit the entire ESCP. If the permit registrant does not receive a response to the revisions from DEQ or Agent within 10 calendar days of receipt, the proposed revisions are deemed accepted.
   vi. DEQ or Agent may require the permit registrant to revise the ESCP at any time. The permit registrant must submit the revisions according to the timeframe specified by DEQ or Agent.

13. Corrective Actions

a. The permit registrant must take corrective actions if any of the following occur:
   i. Significant amounts of sediment or turbidity (as described in A.8.b) are visible downstream of the permitted activities in:
      (1) A conveyance system leading to surface waters;
      (2) Surface waters 50 feet or more downstream of the discharge point; or
      (3) Surface waters at any location where more than one-half of the width of the receiving surface waters is affected.
   ii. The construction activity causes or contributes to a violation of in-stream water quality standards (A.10.a).
   iii. DEQ or the Agent requires the permit registrant to take corrective actions to prevent or control the discharge of significant amounts of sediment or turbidity to surface waters or to conveyance systems that discharge to surface waters.
b. If corrective actions are required, the permit registrant must do all of the following:
   i. Source(s) of sediment must be controlled within 24 hours to prevent continued or additional discharges. Immediately, but no later than 24 hours after initial detection, take corrective actions or implement additional effective BMPs until the significant amounts of sediment or turbidity are no longer visually detectable and to ensure that the requirements of Conditions A.8.b and A.10.a are met;

ii. Document in the inspection records the corrective actions taken; and
iii. Evaluate the control measures and practices to determine the cause of the noncompliance. Submit a written report to DEQ or Agent within 10 calendar days of identifying the need to take corrective action as required in condition 13.a above. This report must include:
   (1) The site common name and DEQ file number.
   (2) Identification of outfalls that were out of compliance.
   (3) Names of personnel conducting inspections.
   (4) A description of the noncompliance and its cause.
   (5) The period of noncompliance.
   (6) Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance (such as specific BMPs that will be implemented or increased inspection frequency).
   (7) ESCP revisions, if revisions were required to prevent and control erosion and sediment discharges.

SCHEDULE B
MINIMUM MONITORING AND RECORDKEEPING REQUIREMENTS

1. Visual Monitoring

a. The following must be monitored visually by a designated Erosion and Sediment Control Inspector:
   i. All areas of the site disturbed by construction activity to ensure that BMPs are in proper working order.
   ii. Discharge point(s) identified in the ESCP for evidence of or the potential for the discharge of pollutants (including sediment and turbidity), and to ascertain whether erosion and sediment control measures are effective in preventing significant impacts to surface waters. Where discharge points are inaccessible, nearby downstream locations must be inspected to the extent that such inspections are practical.
   iii. BMPs identified in the current ESCP to assess whether they are functioning properly.
   iv. Locations where vehicles enter or exit the site for evidence of off-site sediment tracking.
   v. Areas used for storage of materials that are exposed to precipitation for evidence of spillage or other potential to contaminate stormwater runoff.

b. All ESCP controls and practices must be monitored visually according to the following schedule:

Site Condition	Minimum Frequency
1. Active period	Daily when stormwater runoff, including runoff from snow melt, is occurring. At least once every fourteen (14) calendar days, regardless of whether stormwater runoff is occurring.
2. Prior to the site becoming inactive or in anticipation of site inaccessibility	Once to ensure that erosion and sediment control measure are in working order. Any necessary maintenance and repair must be made prior to leaving the site.
3. Inactive periods greater than fourteen (14) consecutive calendar days	Once every month.
4. Periods during which the site is inaccessible due to inclement weather	If practical, inspections must occur daily at a relevant and accessible discharge point or downstream location.
5. Periods during which discharge is unlikely due to frozen conditions.	Monthly. Resume monitoring immediately upon melt, or when weather conditions make discharges likely.

c. Documentation of visual monitoring.
All visual monitoring must document the following:
i. Visual monitoring date and inspector's name.
ii. The construction site name as it appears on the registrant's permit.
iii. The file or site number.
iv. Weather conditions during the inspection, the approximate amount of precipitation since the last inspection, and approximate amount of precipitation during the last 24 hours.
v. Observations for each discharge location. If a discharge location is inaccessible due to safety hazard, document the hazard and record the inspections noted at a relevant discharge point or downstream location if practical.
(1) For each discharge point, make observations:
(a) At the discharge location if the discharge is to a conveyance system leading to surface waters;
(b) From the discharge point to 50 feet downstream if the discharge is to surface waters; and
(c) At any location where more than one-half of the width of the receiving surface water is affected.
(2) For each area observed, document the following:
(a) For turbidity and color, describe any apparent color and the clarity of the discharge, and any apparent difference in comparison with the surface waters.
(b) Describe any sheen or floating material, or record that it is absent. If present, it could indicate concern about a possible spill or leakage from vehicles or materials storage.
vi. Location(s) of BMPs in need of maintenance, inspections of all BMPs, including erosion and sediment controls, chemical and waste controls, locations where vehicles enter and exit the site, status of areas that are under temporary or final stabilization, soil stockpile areas, and non-stormwater pollution (for example, paints, oils, fuels, or adhesives) controls.
vii. Location(s) of BMPs that failed to operate as designed or proved inadequate for a particular location;
viii. Location(s) where additional BMPs are needed that did not exist at the time of inspection; and
ix. Corrective action required and implementation dates.
x. All revisions and documentation of reasons for changes or modifications to the ESCP and other corrective measures.

2. Recordkeeping

a. The permit registrant must keep the ESCP, all revisions to the ESCP, and all visual monitoring records on site.
b. Upon request, the permit registrant must deliver the above records to DEQ, Agent, or the local municipality within three (3) working days of the request.
c. During inactive periods of greater than seven (7) consecutive calendar days, the above records must be retained by the permit registrant but do not need to be at the construction site.
d. The permit registrant must retain all visual monitoring records for at least three (3) years after termination of permit coverage.

SCHEDULE D
SPECIAL CONDITIONS

1. Schedule Precedence

Schedule F contains General Conditions that are included in all general permits issued by DEQ. In the event of any inconsistency between Schedule F and any other schedule of the permit, the requirements in Schedules A through D take precedence.

2. Other Requirements

Registration under this permit does not relieve the permit registrant from all other permitting and licensing requirements. Prior to beginning construction activities, the permit registrant must obtain all other necessary approvals.

3. Termination of Permit Registration

a. To terminate permit coverage, project registrants must
   i. Complete and submit a Notice of Termination form to DEQ or Agent.
   ii. Resolve all outstanding compliance issues.
   iii. Pay all outstanding permit fees.

b. If the project never started (there were no permitted activities and no soil disturbance), there are no additional requirements. For all previously-active projects, permit registrants must also:
   i. Ensure that all final stabilization criteria are met.
   ii. Submit photo-documentation that depicts site stabilization, unless the site has been inspected by DEQ or Agent.
   iii. If portions of the property shown in the original ESCP have been sold, the permit registrant must submit an update of the ESCP depicting new site boundaries.
   iv. For a common plan of development or sale, all portions of the original common plan of development or sale that have been sold must either meet final stabilization criteria (D.3.c) or be covered by the 1200-C or 1200-CN.

c. Final stabilization is determined by satisfying the following criteria:
   i. There is no reasonable potential for discharge of a significant amount of construction related sediment or turbidity to surface waters.
   ii. Construction materials and waste have been removed and disposed of properly. This includes any sediment that was being retained by the temporary erosion and sediment controls.
   iii. All temporary erosion and sediment controls have been removed and disposed of properly, unless doing so conflicts with local requirements.
   iv. All soil disturbance activities have stopped and all stormwater discharges from construction activities that are authorized by this permit have ceased.
   v. All disturbed or exposed areas of the site are covered by either final vegetative stabilization or permanent stabilization measures. However, temporary or permanent stabilization measures are not required for areas that are intended to be left unvegetated or unstabilized following construction (such as dirt access roads, utility pole pads, areas being used for storage of vehicles, equipment, or materials), provided that measures are in place to eliminate or minimize erosion.

d. Permanent stabilization measures are erosion prevention materials designed to provide long-term protection to underlying soils. This may include but is not limited to buildings, paving, riprap, gabions, or geotextiles.

e. Final vegetative stabilization means established and uniform (evenly distributed without large bare areas) perennial vegetation, which provides 70 percent or more coverage, with the following exceptions:
   i. DEQ or Agent may approve less than 70 percent coverage if vegetation is expected to expand, and suitable interim measures (such as mulch or bark) are in place.
   ii. For sites on which it is difficult to establish 70 percent density (for example, in arid, semiarid, and drought-stricken areas), the registrant must cover planted or seeded area with bio or photo degradable erosion controls designed to prevent erosion without active maintenance.
   iii. Sites located on land that is currently employed for farm use as defined in ORS 308A.056 (for example, pipelines across crop or range land, or staging areas for highway construction) that are restored to their preconstruction farm use are not subject to these final vegetative stabilization criteria. Areas disturbed that were not previously employed for farm use, and areas that are not being returned to preconstruction farm use, must meet the conditions for final vegetative stabilization.

4. Local Public Agencies Acting as DEQ's Agent

DEQ authorizes local public agencies to act as its Agent in implementing this permit if they entered into a Memorandum of Agreement (MOA). The Agent may be authorized to conduct the following activities, including but not limited to: application and ESCP review, inspections, monitoring data review, stormwater monitoring and enforcement.

5. Permit-Specific Definitions

a. *Agent* means a governmental entity that has an agreement with DEQ to administer this general permit within their jurisdictional boundaries.
b. *Agricultural Land* means cropland, grassland, rangeland, pasture, and other land on which agricultural or forest-related products or livestock are produced. Agricultural lands include cropped woodland, marshes, incidental areas included in the agricultural operation, and other types of land used for the production of livestock.
c. *Best Management Practices or BMPs* means schedules of activities, prohibitions of practices, maintenance procedures, and other physical, structural or managerial practices to prevent or reduce the pollution of waters of the state. BMPs include treatment systems, erosion and sediment control, source control, and operating procedures and practices to control site runoff, spillage or leaks, and waste disposal.
d. *Borrow Area* means the area from which material is excavated to be used as fill material in another area.
e. *Clean Water Act or CWA* means the Federal Water Pollution Control Act enacted by Public Law 92-500, as amended by Public Laws 95-217, 95-576, 96-483, and 97-117; USC 1251 et seq.
f. *Conveyance System* means, for the purposes of this permit, a sewer, ditch, pipe, channel, swale or similar component that is designed to carry water; or any combination of such components.
g. *DEQ* means the Oregon Department of Environmental Quality.
h. *Detention* means the temporary storage of stormwater to improve quality or reduce the volumetric flow rate of discharge or both.
i. *Dewatering* means the removal and disposal of surface water or groundwater during site construction.
j. *Discharge Point* means the location where stormwater leaves the site. It includes the location where stormwater is discharged to surface water or a stormwater conveyance system.
k. *Erosion* means the movement of soil particles or rock fragments by water or wind.
l. *Erosion and Sediment Control BMPs* means BMPs that are intended to prevent erosion and sedimentation, such as preserving natural vegetation, seeding, mulching and matting, plastic

covering, sediment fences, and sediment traps and ponds. Erosion and sediment control BMPs are synonymous with stabilization and structural BMPs.

m. *Hazardous Materials* means the materials defined in 40 CFR part 302 Designation, Reportable Quantities, and Notification.

n. *Legally Authorized Representative* means the following (please see 40 CFR §122.22 for more detail, if needed):
   - For a corporation - president, secretary, treasurer, vice-president, or any person who performs principal business functions; or a manager of one or more facilities that is authorized in accordance to corporate procedure to sign such documents.
   - For a partnership - general partner.
   - For a sole proprietorship - Owner(s) [each owner must sign the application].
   - For a city, county, state, federal, or other public facility - principal executive officer or ranking elected official.
   - For a Limited Liability Company - Member [articles of organization].
   - For trusts – Acting trustee.

o. *Local Government* means any county, city, town, or service district.

p. *National Pollutant Discharge Elimination System or NPDES* means the national program under Section 402 of the Clean Water Act for regulation of point source discharges of pollutants to waters of the United States.

q. *Natural Buffer* means, for the purposes of this permit, an area of undisturbed natural cover surrounding surface waters within which construction activities are restricted. Natural cover includes the natural vegetation, exposed rock, and barren ground that existed prior to commencement of earth-disturbing activities.

r. *Natural Vegetation* means vegetation that occurs spontaneously without regular management, maintenance, or species introductions or removals. For purposes of this permit, this includes invasive species.

s. *Non-Stormwater Pollution Controls* means general site and materials management measures that directly or indirectly aid in minimizing the discharge of sediment and other construction related pollutants from the construction site.

t. *Owner or operator* means the owner or operator of any ‘‘facility or activity’’ subject to regulation under the NPDES program. Owners or operators may be individuals or other legal entities.
   i. Operator for the purposes of this permit, means any person associated with a construction project that meets either of the following two criteria:
      (1) The person has operational control over construction plans and specifications, including the authority to make modifications to those plans and specifications; or
      (2) The person has day-to-day operational control of those activities at a project which are necessary to ensure compliance with a ESCP for the site or other permit conditions (for example, they are authorized to direct workers at a site to carry out activities required by the ESCP or comply with other permit conditions).
   ii. Owner for the purposes of this permit means any person with a legal interest in the permitted activities or the property on which the permitted activities occur.

u. *Permit Registrant* means the owner or operator of the construction activity regulated by this permit that has submitted an application and received notice of registration under this general permit by DEQ or Agent.

v. *Person* means not only individuals, but also includes, corporations, associations, firms, partnerships, joint stock companies, public and municipal corporations, political subdivisions, the state and any agencies thereof, and the federal government and any agencies thereof.

w. *Pollutant* as defined in 40 CFR §122.2 means dredged spoil, solid waste, incinerator residue, filter backwash, sewage, garbage, domestic sewage sludge (biosolids), munitions, chemical

wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, soil, cellar dirt and industrial, municipal, and agricultural waste discharge into water. It does not mean sewage from vessels within the meaning of section 312 of the FWPCA, nor does it include dredged or fill material discharged in accordance with a permit issued under section 404 of the FWPCA.

x. *Pollution or Water Pollution* as defined by ORS 468B.005(3) means such alteration of the physical, chemical or biological properties of any waters of the state, including change in temperature, taste, color, turbidity, silt or odor of the waters, or such discharge of any liquid, gaseous, solid, radioactive or other substance into any waters of the state, which will or tends to, either by itself or in connection with any other substance, create a public nuisance or which will or tends to render such waters harmful, detrimental or injurious to public health, safety or welfare, or to domestic, commercial, industrial, agricultural, recreational or other legitimate beneficial uses or to livestock, wildlife, fish or other aquatic life or the habitat thereof.
y. *Runoff Controls* means BMPs that are designed to control the peak volume and flow rate or to prevent scour due to concentrated flows.
z. *Sediment* means mineral or organic matter, typically deposited by water, air, or ice.
aa. *Site* means the area where the construction activity is physically located or conducted.
bb. *Stormwater Conveyance* means a sewer, ditch, or swale that is designed to carry stormwater; a stormwater conveyance may also be referred to as a storm drain or storm sewer.
cc. *Stormwater as defined by 40 CFR §122.26(b)(13)* means stormwater runoff, snow melt runoff, and surface runoff and drainage.
dd. *Surface Runoff* means that portion of stormwater that does not infiltrate into the ground or evaporate, but instead flows onto adjacent land or watercourses or is routed to stormwater conveyance systems.
ee. *Surface Water* means all water naturally open to the atmosphere (for example, rivers, lakes, reservoirs, ponds, streams, impoundments, oceans, estuaries, springs, etc.).
ff. *Total Maximum Daily Load or TMDL* means a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet state water quality standards. It is the sum of the allowable loads of a single pollutant from all contributing point and nonpoint sources. Percentages of the TMDL are allocated by DEQ to the various pollutant sources.
gg. *Turbidity* means the optical condition of waters caused by suspended or dissolved particles or colloids that scatter and absorb light rays instead of transmitting light in straight lines through the water column. Turbidity may be expressed as nephelometric turbidity units (NTUs) measured with a calibrated turbidity meter.
hh. *Underground Injection Control* means any system, structure, or activity that is created to place fluid below the ground or sub-surface (for example, sumps, infiltration galleries, drywells, trench drains, drill holes, etc.)
ii. *Water or Waters of the State as defined by ORS 468B.005(8)* means lakes, bays, ponds, impounding reservoirs, springs, wells, rivers, streams, creeks, estuaries, marshes, inlets, canals, the Pacific Ocean within the territorial limits of the State of Oregon and all other bodies of surface or underground waters, natural or artificial, inland or coastal, fresh or salt, public or private (except those private waters which do not combine or effect a junction with natural surface or underground waters), which are wholly or partially within or bordering the state or within its jurisdiction.

SCHEDULE F
NPDES GENERAL CONDITIONS – INDUSTRIAL FACILITIES
October 1, 2015 Version

SECTION A. STANDARD CONDITIONS

A1. Duty to Comply with Permit

The permittee must comply with all conditions of this permit. Failure to comply with any permit condition is a violation of Oregon Revised Statutes (ORS) 468B.025 and the federal Clean Water Act and is grounds for an enforcement action. Failure to comply is also grounds for DEQ to terminate, modify and reissue, revoke, or deny renewal of a permit.

A2. Penalties for Water Pollution and Permit Condition Violations

The permit is enforceable by DEQ or EPA, and in some circumstances also by third-parties under the citizen suit provisions of 33 USC § 1365. DEQ enforcement is generally based on provisions of state statutes and Environmental Quality Commission (EQC) rules, and EPA enforcement is generally based on provisions of federal statutes and EPA regulations.

ORS 468.140 allows DEQ to impose civil penalties up to $25,000 per day for violation of a term, condition, or requirement of a permit. The federal Clean Water Act provides for civil penalties not to exceed $37,500 and administrative penalties not to exceed $16,000 per day for each violation of any condition or limitation of this permit.

Under ORS 468.943, unlawful water pollution in the second degree, is a Class A misdemeanor and is punishable by a fine of up to $25,000, imprisonment for not more than one year, or both. Each day on which a violation occurs or continues is a separately punishable offense. The federal Clean Water Act provides for criminal penalties of not more than $50,000 per day of violation, or imprisonment of not more than 2 years, or both for second or subsequent negligent violations of this permit.

Under ORS 468.946, unlawful water pollution in the first degree is a Class B felony and is punishable by a fine up to $250,000, imprisonment for not more than 10 years or both. The federal Clean Water Act provides for criminal penalties of $5,000 to $50,000 per day of violation, or imprisonment of not more than 3 years, or both for knowing violations of the permit. In the case of a second or subsequent conviction for knowing violation, a person is subject to criminal penalties of not more than $100,000 per day of violation, or imprisonment of not more than 6 years, or both.

A3. Duty to Mitigate

The permittee must take all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of this permit. In addition, upon request of DEQ, the permittee must correct any adverse impact on the environment or human health resulting from noncompliance with this permit, including such accelerated or additional monitoring as necessary to determine the nature and impact of the noncomplying discharge.

A4. Duty to Reapply

If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and have the permit renewed. The application must be submitted at least 180 days before the expiration date of this permit.

DEQ may grant permission to submit an application less than 180 days in advance but no later than the permit expiration date.

A5. Permit Actions

This permit may be modified, revoked and reissued, or terminated for cause including, but not limited to, the following:

a. Violation of any term, condition, or requirement of this permit, a rule, or a statute.
b. Obtaining this permit by misrepresentation or failure to disclose fully all material facts.
c. A change in any condition that requires either a temporary or permanent reduction or elimination of the authorized discharge.
d. The permittee is identified as a Designated Management Agency or allocated a wasteload under a total maximum daily load (TMDL).
e. New information or regulations.
f. Modification of compliance schedules.
g. Requirements of permit reopener conditions.
h. Correction of technical mistakes made in determining permit conditions.
i. Determination that the permitted activity endangers human health or the environment.
j. Other causes as specified in 40 CFR §§ 122.62, 122.64, and 124.5.

The filing of a request by the permittee for a permit modification, revocation or reissuance, termination, or a notification of planned changes or anticipated noncompliance does not stay any permit condition.

A6. Toxic Pollutants

The permittee must comply with any applicable effluent standards or prohibitions established under Oregon Administrative Rules (OAR) 340-041-0033 and 307(a) of the federal Clean Water Act for toxic pollutants and with standards for sewage sludge use or disposal established under section 405(d) of the federal Clean Water Act within the time provided in the regulations that establish those standards or prohibitions, even if the permit has not yet been modified to incorporate the requirement.

A7. Property Rights and Other Legal Requirements

The issuance of this permit does not convey any property rights of any sort, or any exclusive privilege, or authorize any injury to persons or property or invasion of any other private rights, or any infringement of federal, tribal, state, or local laws or regulations.

A8. Permit References

Except for effluent standards or prohibitions established under section 307(a) of the federal Clean Water Act and OAR 340-041-0033 for toxic pollutants, and standards for sewage sludge use or disposal established under section 405(d) of the federal Clean Water Act, all rules and statutes referred to in this permit are those in effect on the date this permit is issued.

A9. Permit Fees

The permittee must pay the fees required by OAR.

SECTION B. OPERATION AND MAINTENANCE OF POLLUTION CONTROLS

B1. Proper Operation and Maintenance

The permittee must at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) that are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires

the operation of back-up or auxiliary facilities or similar systems that are installed by a permittee only when the operation is necessary to achieve compliance with the conditions of the permit.

B2. Need to Halt or Reduce Activity Not a Defense

For industrial or commercial facilities, upon reduction, loss, or failure of the treatment facility, the permittee must, to the extent necessary to maintain compliance with its permit, control production or all discharges or both until the facility is restored or an alternative method of treatment is provided. This requirement applies, for example, when the primary source of power of the treatment facility fails or is reduced or lost. It is not a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

B3. Bypass of Treatment Facilities

a. Definitions
   (1) "Bypass" means intentional diversion of waste streams from any portion of the treatment facility. The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, provided the diversion is to allow essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of paragraphs b and c of this section.
   (2) "Severe property damage" means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources that can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

b. Prohibition of bypass.
   (1) Bypass is prohibited and DEQ may take enforcement action against a permittee for bypass unless:
      i. Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;
      ii. There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate backup equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass that occurred during normal periods of equipment downtime or preventative maintenance; and
      iii. The permittee submitted notices and requests as required under General Condition B3.c.
   (2) DEQ may approve an anticipated bypass, after considering its adverse effects and any alternatives to bypassing, when DEQ determines that it will meet the three conditions listed above in General Condition B3.b(1).

c. Notice and request for bypass.
   (1) Anticipated bypass. If the permittee knows in advance of the need for a bypass, a written notice must be submitted to DEQ at least ten days before the date of the bypass.
   (2) Unanticipated bypass. The permittee must submit notice of an unanticipated bypass as required in General Condition D5.

B4. Upset

a. Definition. "Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent

caused by operation error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventative maintenance, or careless or improper operation.

b. Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology-based permit effluent limitations if the requirements of General Condition B4.c are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

c. Conditions necessary for a demonstration of upset. A permittee who wishes to establish the affirmative defense of upset must demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:
   (1) An upset occurred and that the permittee can identify the causes(s) of the upset;
   (2) The permitted facility was at the time being properly operated;
   (3) The permittee submitted notice of the upset as required in General Condition D5, hereof (24-hour notice); and
   (4) The permittee complied with any remedial measures required under General Condition A3 hereof.

d. Burden of proof. In any enforcement proceeding the permittee seeking to establish the occurrence of an upset has the burden of proof.

B5. Treatment of Single Operational Upset

For purposes of this permit, a single operational upset that leads to simultaneous violations of more than one pollutant parameter will be treated as a single violation. A single operational upset is an exceptional incident that causes simultaneous, unintentional, unknowing (not the result of a knowing act or omission), temporary noncompliance with more than one federal Clean Water Act effluent discharge pollutant parameter. A single operational upset does not include federal Clean Water Act violations involving discharge without a NPDES permit or noncompliance to the extent caused by improperly designed or inadequate treatment facilities. Each day of a single operational upset is a violation.

B6. Public Notification of Effluent Violation

If effluent limitations specified in this permit are exceeded or an overflow occurs that threatens public health, the permittee must take such steps as are necessary to alert the public, health agencies and other affected entities (for example, public water systems) about the extent and nature of the discharge in accordance with the notification procedures developed under General Condition B7. Such steps may include, but are not limited to, posting of the river at access points and other places, news releases, and paid announcements on radio and television.

B7. Emergency Response and Public Notification Plan

The permittee must develop and implement an emergency response and public notification plan that identifies measures to protect public health from bypasses or upsets that may endanger public health. At a minimum the plan must include mechanisms to:

a. Ensure that the permittee is aware (to the greatest extent possible) of such events;
b. Ensure notification of appropriate personnel and ensure that they are immediately dispatched for investigation and response;
c. Ensure immediate notification to the public, health agencies, and other affected entities (including public water systems). The response plan must identify the public health and other officials who will receive immediate notification;
d. Ensure that appropriate personnel are aware of and follow the plan and are appropriately trained;
e. Provide emergency operations; and

f. Ensure that DEQ is notified of the public notification steps taken.

B8. Removed Substances

Solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters must be disposed of in such a manner as to prevent any pollutant from such materials from entering waters of the state, causing nuisance conditions, or creating a public health hazard.

SECTION C. MONITORING AND RECORDS

C1. Representative Sampling

Sampling and measurements taken as required herein must be representative of the volume and nature of the monitored discharge. All samples must be taken at the monitoring points specified in this permit, and must be taken, unless otherwise specified, before the effluent joins or is diluted by any other waste stream, body of water, or substance. Monitoring points must not be changed without notification to and the approval of DEQ. Samples must be collected in accordance with requirements in 40 CFR part 122.21 and 40 CFR part 403 Appendix E.

C2. Flow Measurements

Appropriate flow measurement devices and methods consistent with accepted scientific practices must be selected and used to ensure the accuracy and reliability of measurements of the volume of monitored discharges. The devices must be installed, calibrated and maintained to insure that the accuracy of the measurements is consistent with the accepted capability of that type of device. Devices selected must be capable of measuring flows with a maximum deviation of less than ± 10 percent from true discharge rates throughout the range of expected discharge volumes.

C3. Monitoring Procedures

Monitoring must be conducted according to test procedures approved under 40 CFR part 136 or, in the case of sludge (biosolids) use and disposal, approved under 40 CFR part 503 unless other test procedures have been specified in this permit.

For monitoring of recycled water with no discharge to waters of the state, monitoring must be conducted according to test procedures approved under 40 CFR part 136 or as specified in the most recent edition of Standard Methods for the Examination of Water and Wastewater unless other test procedures have been specified in this permit or approved in writing by DEQ.

C4. Penalties for Tampering

The federal Clean Water Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit may, upon conviction, be punished by a fine of not more than $10,000 per violation, imprisonment for not more than two years, or both. If a conviction of a person is for a violation committed after a first conviction of such person, punishment is a fine not more than $20,000 per day of violation, or by imprisonment of not more than four years, or both.

C5. Reporting of Monitoring Results

Monitoring results must be summarized each month on a discharge monitoring report form approved by DEQ. The reports must be submitted monthly and are to be mailed, delivered or otherwise transmitted by the 15th day of the following month unless specifically approved otherwise in Schedule B of this permit.

C6. Additional Monitoring by the Permittee

If the permittee monitors any pollutant more frequently than required by this permit, using test procedures approved under 40 CFR part 136 or, in the case of sludge (biosolids) use and disposal, approved under 40 CFR part 503 or as specified in this permit, the results of this monitoring must be included in the calculation and reporting of the data submitted in the discharge monitoring report. Such increased frequency must also be indicated. For a pollutant parameter that may be sampled more than once per day (for example, total residual chlorine), only the average daily value must be recorded unless otherwise specified in this permit.

C7. Averaging of Measurements

Calculations for all limitations that require averaging of measurements must utilize an arithmetic mean, except for bacteria which must be averaged as specified in this permit.

C8. Retention of Records

Records of monitoring information required by this permit related to the permittee's sewage sludge use and disposal activities must be retained for a period of at least 5 years (or longer as required by 40 CFR part 503). Records of all monitoring information including all calibration and maintenance records, all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit and records of all data used to complete the application for this permit must be retained for a period of at least 3 years from the date of the sample, measurement, report, or application. This period may be extended by request of DEQ at any time.

C9. Records Contents

Records of monitoring information must include:

a. The date, exact place, time, and methods of sampling or measurements;
b. The individual(s) who performed the sampling or measurements;
c. The date(s) analyses were performed;
d. The individual(s) who performed the analyses;
e. The analytical techniques or methods used; and
f. The results of such analyses.

C10. Inspection and Entry

The permittee must allow DEQ or EPA upon the presentation of credentials to:

a. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;
b. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;
c. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and
d. Sample or monitor at reasonable times, for the purpose of assuring permit compliance or as otherwise authorized by state law, any substances or parameters at any location.

C11. Confidentiality of Information

Any information relating to this permit that is submitted to or obtained by DEQ is available to the public unless classified as confidential by the Director of DEQ under ORS 468.095. The permittee may request that information be classified as confidential if it is a trade secret as defined by that statute. The name and address of the permittee, permit applications, permits, effluent data, and information required by NPDES application forms under 40 CFR § 122.21 are not classified as confidential [40 CFR § 122.7(b)].

SECTION D. REPORTING REQUIREMENTS

D1. Planned Changes

The permittee must comply with OAR 340-052, "Review of Plans and Specifications" and 40 CFR § 122.41(l)(1). Except where exempted under OAR 340-052, no construction, installation, or modification involving disposal systems, treatment works, sewerage systems, or common sewers may be commenced until the plans and specifications are submitted to and approved by DEQ. The permittee must give notice to DEQ as soon as possible of any planned physical alternations or additions to the permitted facility.

D2. Anticipated Noncompliance

The permittee must give advance notice to DEQ of any planned changes in the permitted facility or activity that may result in noncompliance with permit requirements.

D3. Transfers

This permit may be transferred to a new permittee provided the transferee acquires a property interest in the permitted activity and agrees in writing to fully comply with all the terms and conditions of the permit and EQC rules. No permit may be transferred to a third party without prior written approval from DEQ. DEQ may require modification or revocation and reissuance of the permit to change the name of the permittee and incorporate such other requirements as may be necessary under 40 CFR § 122.61. The permittee must notify DEQ when a transfer of property interest takes place.

D4. Compliance Schedule

Reports of compliance or noncompliance with, or any progress reports on interim and final requirements contained in any compliance schedule of this permit must be submitted no later than 14 days following each schedule date. Any reports of noncompliance must include the cause of noncompliance, any remedial actions taken, and the probability of meeting the next scheduled requirements.

D5. Twenty-Four Hour Reporting

The permittee must report any noncompliance that may endanger health or the environment. Any information must be provided orally (by telephone) within 24 hours from the time the permittee becomes aware of the circumstances, unless a shorter time is specified in the permit. During normal business hours, the DEQ regional office must be called. Outside of normal business hours, DEQ must be contacted at 1-800-452-0311 (Oregon Emergency Response System).

The following must be included as information that must be reported within 24 hours under this paragraph:

a. Any unanticipated bypass that exceeds any effluent limitation in this permit;
b. Any upset that exceeds any effluent limitation in this permit;
c. Violation of maximum daily discharge limitation for any of the pollutants listed by DEQ in this permit; and
d. Any noncompliance that may endanger human health or the environment.

A written submission must also be provided within 5 days of the time the permittee becomes aware of the circumstances. The written submission must contain:

e. A description of noncompliance and its cause;
f. The period of noncompliance, including exact dates and times;
g. The estimated time noncompliance is expected to continue if it has not been corrected;

h. Steps taken or planned to reduce, eliminate and prevent reoccurrence of the noncompliance; and
i. Public notification steps taken, pursuant to General Condition B7.

DEQ may waive the written report on a case-by-case basis if the oral report has been received within 24 hours.

D6. Other Noncompliance

The permittee must report all instances of noncompliance not reported under General Condition D4 or D5, at the time monitoring reports are submitted. The reports must contain:

a. A description of the noncompliance and its cause;
b. The period of noncompliance, including exact dates and times;
c. The estimated time noncompliance is expected to continue if it has not been corrected; and
d. Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

D7. Duty to Provide Information

The permittee must furnish to DEQ within a reasonable time any information that DEQ may request to determine compliance with the permit or to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit. The permittee must also furnish to DEQ, upon request, copies of records required to be kept by this permit.

Other Information: When the permittee becomes aware that it has failed to submit any relevant facts or has submitted incorrect information in a permit application or any report to DEQ, it must promptly submit such facts or information.

D8. Signatory Requirements

All applications, reports or information submitted to DEQ must be signed and certified in accordance with 40 CFR § 122.22.

D9. Falsification of Information

Under ORS 468.953, any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance, is subject to a Class C felony punishable by a fine not to exceed $125,000 per violation and up to 5 years in prison per ORS chapter 161. Additionally, according to 40 CFR § 122.41(k)(2), any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit including monitoring reports or reports of compliance or non-compliance will, upon conviction, be punished by a federal civil penalty not to exceed $10,000 per violation, or by imprisonment for not more than 6 months per violation, or by both.

D10. Changes to Discharges of Toxic Pollutant

The permittee must notify DEQ as soon as it knows or has reason to believe the following:

a. That any activity has occurred or will occur that would result in the discharge, on a routine or frequent basis, of any toxic pollutant that is not limited in the permit, if that discharge will exceed the highest of the following "notification levels:
   (1) One hundred micrograms per liter (100 µg/l);
   (2) Two hundred micrograms per liter (200 µg/l) for acrolein and acrylonitrile; five hundred micrograms per liter (500 µg/l) for 2,4-dinitrophenol and for 2-methyl-4,6-dinitrophenol; and one milligram per liter (1 mg/l) for antimony;
   (3) Five (5) times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 CFR § 122.21(g)(7); or

(4) The level established by DEQ in accordance with 40 CFR § 122.44(f).

b. That any activity has occurred or will occur that would result in any discharge, on a non-routine or infrequent basis, of a toxic pollutant that is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":
   (1) Five hundred micrograms per liter (500 µg/l);
   (2) One milligram per liter (1 mg/l) for antimony;
   (3) Ten (10) times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 CFR § 122.21(g)(7); or
   (4) The level established by DEQ in accordance with 40 CFR § 122.44(f).

SECTION E. DEFINITIONS

E1. *BOD or BOD_5* means five-day biochemical oxygen demand.
E2. *CBOD or $CBOD_5$* means five-day carbonaceous biochemical oxygen demand.
E3. *TSS* means total suspended solids.
E4. *Bacteria* means but is not limited to fecal coliform bacteria, total coliform bacteria, *Escherichia coli* (*E. coli*) bacteria, and *Enterococcus* bacteria.
E5. *FC* means fecal coliform bacteria.
E6. *Total residual chlorine* means combined chlorine forms plus free residual chlorine
E7. *Technology based permit effluent limitations* means technology-based treatment requirements as defined in 40 CFR § 125.3, and concentration and mass load effluent limitations that are based on minimum design criteria specified in OAR 340-041.
E8. *mg/l* means milligrams per liter.
E9. *µg/l* means microgram per liter.
E10. *kg* means kilograms.
E11. *m^3/d* means cubic meters per day.
E12. *MGD* means million gallons per day.
E13. *Average monthly effluent limitation* as defined at 40 CFR § 122.2 means the highest allowable average of daily discharges over a calendar month, calculated as the sum of all daily discharges measured during a calendar month divided by the number of daily discharges measured during that month.
E14. *Average weekly effluent limitation* as defined at 40 CFR § 122.2 means the highest allowable average of daily discharges over a calendar week, calculated as the sum of all daily discharges measured during a calendar week divided by the number of daily discharges measured during that week.
E15. *Daily discharge* as defined at 40 CFR § 122.2 means the discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. For pollutants with limitations expressed in units of mass, the daily discharge must be calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurement, the daily discharge must be calculated as the average measurement of the pollutant over the day.
E16. *24-hour composite sample* means a sample formed by collecting and mixing discrete samples taken periodically and based on time or flow.
E17. *Grab sample* means an individual discrete sample collected over a period of time not to exceed 15 minutes.
E18. *Quarter* means January through March, April through June, July through September, or October through December.
E19. *Month* means calendar month.
E20. *Week* means a calendar week of Sunday through Saturday.

Oregon
Kate Brown, Governor

Department of Environmental Quality
Northwest Region Portland Office/Water Quality
700 NE Multnomah Street, Suite 600
Portland, OR 97232
(503) 229-5263
FAX (503) 229-6957
TTY 711

December 16, 2020

DARYN ANDERSON
CITY OF ROSEBURG
900 SE DOUGLAS AVE
ROSEBURG, OR, 97470-3333

Re: Renewal of NPDES 1200-C Construction Stormwater General Permit
Permit#33857
File #126872
WEST AVENUE WATER MAIN EXTENSION, NE WEST AVENUE AND NE WALNUT STREET TO R, ROSEBURG
DOUGLAS County

DEQ has renewed your 1200-C permit coverage for the above-referenced site. This permit is valid until December 14, 2025 and is located on DEQ's website along with all forms and technical assistance:

https://www.oregon.gov/deq/wq/wqpermits/Pages/Stormwater-Construction.aspx

Please read your permit carefully and comply with all permit requirements including:

- By May 15, 2021, sites under 5 acres must have visual monitoring conducted by a person certified in a DEQ approved erosion and sediment control program (See Section 6.1).
- Revise the ESCP contents and site map to ensure that the requirements of this permit are addressed by February 15, 2021 (See Section 4).
- The addition of post-coverage phases within a proposed common plan of development will require separate 1200-C coverage (See Section 1.2.3).
- Inspect erosion and sediment controls daily when there is runoff; and once every 14 calendar days during active periods. Record these inspections and maintain records on site (See Section 6.2).
- Report to DEQ when major changes are made to your ESCP or when permit conditions are violated (See Section 5).

Change in project owner or operator
If the legally responsible entity for the site changes, permit coverage must be transferred to the new entity. Send the Permit Transfer form (found on the weblink above) with the transfer fee and DEQ will update permit coverage for the site.

Terminate permit coverage to avoid fees
To avoid paying additional fees, terminate permit coverage using the Notice of Termination form when soil disturbance is finished, soils are stabilized, and temporary erosion and sediment controls have been removed.

Please contact Blair Edwards, Stormwater Program Coordinator at (503) 229-5185 or by e-mail at edwards.blair@deq.state.or.us with any questions.

Respectfully,
Christine Svetkovich
Christine Svetkovich
Water Quality Manager

Oregon Department of Environmental Quality

Name Change and/or Permit Transfer

for NPDES Permit No. 1200-C

National Pollutant Discharge Elimination System Construction Stormwater Discharge General Permits

OFFICAL USE ONLY			
Legal Name Confirmed: Y ☐ N ☐	Amount: $_____	Deposit #: _____	Application #: _____
Outstanding Invoices: Y ☐ N ☐	Check #: _____	Receipt #: _____	Date Received: _____
Enforcement Actions: Y ☐ N ☐	Check Name: _____		Notes: _____

A. ACTION TO BE PERFORMED

1. Name Change/Effective Or Schedule Date:	2. Transfer of Permit/Schedule Date:

B. PREVIOUS INFORMATION

3. Previous Registrant:
Previous Project Name:

4. Project Address or Cross Street: Project City, State, Zip Code: Project County:	5. Permit # : DEQ File # :

C. NEW INFORMATION

6. New or Current Project Name:

7. New Applicant/Registrant:

8. Legal Contact Name: Title:
Mailing Address, City, State, Zip Code:
Email Address: Telephone # :

9. Architect/Engineering Firm:
Project Manager: Title:
Email Address: Telephone # :

10. Invoice Contact: Title:
Mailing Address, City, State, Zip Code:
Email Address: Telephone # :

11. Name of Designated Erosion and Sediment Control Inspector:
Qualifications or Training Program: Company Name:
Certification Number: Telephone # :
Expiration Date: Email Address:

12. Total Project Site Area (acres): Total Disturbed Area (acres):
Total Number of Lots:

D. SIGNATURE REQUIRED FOR NAME CHANGE

DEQ is unable to transfer this permit if there are any outstanding invoices.

New Registrant: I hereby certify that the information contained in this application is true and correct to the best of my knowledge and belief. In addition, I agree to pay all permit fees required by Oregon Administrative Rules 340-045. This includes a compliance determination fee invoiced annually by DEQ to maintain the permit.

Name of Legally Authorized Representative	**Title**
Signature of Legally Authorized Representative	**Date**

E: SIGNATURE REQUIRED FOR TRANSFER OF PERMIT

DEQ is unable to transfer this permit if there are any outstanding invoices.

Previous Registrant: I hereby acknowledge the pending transfer of the above referenced permit

Name of Legally Authorized Representative	**Title**
Signature of Legally Authorized Representative	**Date**

New Registrant: I hereby apply for permission to transfer the above referenced permit and certify that I have acquired a property interest in the permitted activity. I agree to fully comply with all terms and conditions of the permit and DEQ rules. Additionally, I agree to pay all permit fees required by Oregon Administrative Rules 340-045. This includes a compliance determination fee invoiced annually by DEQ to maintain the permit.

Name of Legally Authorized Representative	**Title**
Signature of Legally Authorized Representative	**Date**

DEQ Agents

City of Eugene 99 W. 10th Avenue Eugene, OR 97401 541-682-2706	**City of Hermiston** 215 Gladys Avenue Hermiston, OR 97838 541-667-5025	**City of Troutdale** 342 SW 4th Street Troutdale, OR 97060 503-674-3300
Clean Water Services 2550 SW Hillsboro Highway Hillsboro, OR 97123 503-681-5101 *Includes Banks, Beaverton, Cornelius, Durham, Forest Grove, Gaston, Hillsboro, King City, North Plains, Sherwood, Tigard, Tualatin, and portions of Washington Co.*	**Rogue Valley Sewer Services** 138 West Vilas Road, PO Box 3130 Central Point, OR 97502 541-664-6300	

DEQ Northwest Region	DEQ Western Region	DEQ Eastern Region
700 Lloyd Building 700 NE Multnomah St., Suite #600, Portland, OR 97232 503-229-5886 *Clackamas, Clatsop, Columbia, Multnomah, Tillamook, Washington*	165 East 7th Avenue, Suite 100 Eugene, OR 97401 541-686-7930 *Benton, Coos, Curry, Douglas, Jackson, Josephine, Lane, Lincoln, Linn, Marion, Polk, Yamhill*	800 SE Emigrant Avenue, Suite 330 Pendleton, OR 97801 541-278-4605 *Baker, Crook, Deschutes, Gilliam, Grant, Harney, Hood River, Jefferson, Klamath, Lake, Malheur, Marrow, Sherman, Umatilla, Union, Wallowa, Wasco, Wheeler*

NAME CHANGE AND/OR TRANSFER INSTRUCTIONS

A. Action to be performed

Check the appropriate box to indicate a name change and/or permit transfer.

1. For a ***name change***, provide the effective or scheduled date of the name change. Please note that for name changes, DEQ prefers to process your request after the name has been legally changed to avoid incorrectly modifying its files should the change not occur.
2. To ***transfer a permit*** to a new owner, provide the date on which you want the transfer to occur. Transfer will not occur until DEQ has received the appropriate signatures and fee and reviewed the transfer information. Approval of a transfer may take up to 30 days to process.

B. Previous information

3. Enter the previous applicant/registrant (or entity legally responsible for permit) and previous project name.
4. Enter the project's physical address or cross street, including city, state, zip code, and county.
5. Enter the DEQ permit number and facility file number (also known as the site ID number; this number may be found on the first page of your permit).

C. New information

6. Provide the common name of the project (for example, the name of the subdivision), the location of the site, and, if available, a street address.
7. Enter the legal name of the new applicant/registrant. This must be the legal Oregon name (i.e., Acme Products, Inc.) or the legal representative of the company if it operates under an assumed business name (i.e., John Smith, dba Acme Products). The name must be a legal, active name registered with the Oregon Department of Commerce, Corporation Division (503) 378-4752, (http://egov.sos.state.or.us/br/pkg_web_name_srch_inq.login), unless otherwise exempted by their regulations. The permit will be issued to the legal name of the applicant.
8. Provide contact information for the legal and general correspondence with the applicant.
9. Provide contact information for the Architect or Consulting Engineer who designed the Erosion and Sediment Control Plan (ESCP) and Dewatering Plan, if applicable.
10. Provide invoice contact information for billing of DEQ annual permit fee if different from the applicant in #1 above. This is the person or entity legally responsible for payment of the annual fee invoice. This must be the same company as the applicant, not a third party independent of the applicant.
11. Provide information on the Erosion and Sediment Control Inspector. This is not a DEQ or DEQ Agent inspector; this is an inspector employed by the applicant. As of January 1, 2017, for project 5 acres or more include inspectors' qualification program, certification number and expiration date. Review the 1200-C permit for additional information.
12. Provide information on the project size as indicated (based on the total project and not just a single phase).

D. Signature required for name change

The signature of a legally authorized representative must be obtained before DEQ will change the name of a permit registrant. The name must be a legal, active name registered with the Secretary of State - Corporation Division unless otherwise exempt by regulation (503-986-2200 or http://sos.oregon.gov/business/Pages/register.aspx).

E. Signatures required for permit transfer

The signatures of legally authorized representatives from the previous registrant and new registrant must be obtained before DEQ will transfer a permit. If the previous owner is not available, DEQ will accept a bill of sale or other proof that the new registrant has acquired a property interest in the permitted activity. The name must be a legal, active name registered with the Secretary of State - Corporation Division unless otherwise exempt by regulation (503-986-2200 or http://sos.oregon.gov/business/Pages/register.aspx).

DEFINITION OF LEGALLY AUTHORIZED REPRESENTATIVE

Please also provide the information requested in brackets *[ ]* (please see 40 CFR §122.22 for more detail, if needed)

- **Corporation** - president, secretary, treasurer, vice-president, or any person who performs principal business functions; or a manager of one or more facilities that is authorized in accordance to corporate procedure to sign such documents.
- **Partnership** - General partner *[list of general partners, their addresses, and telephone numbers]*.
- **Sole Proprietorship** - Owner(s) *[each owner must sign the application]*.
- **City, County, State, Federal, or other Public Facility** - Principal executive officer or ranking elected official.
- **Limited Liability Company** - Member *[articles of organization]*.
- **Trusts –** Acting trustee *[list of trustees, their addresses, and telephone numbers]*.

Fee and application submittal

Please reference the current fee table to determine the appropriate fees for your permit. Make your check payable to the Department of Environmental Quality, if permit is administrated by DEQ.

General Authorization for Temporary Impacts to Non-tidal Wetlands

The following conditions apply to all projects determined to be eligible for this general authorization:

(1) **Responsible Party.** The person listed on the notification as the responsible party is responsible for the activities of all contractors or other operators involved in project work covered by the GA.

(2) **Copy of Approved Notification Available for Inspection**. A copy of the notification approved by the Department must be available at the work site whenever noticed activities are being conducted.

(3) **Site Access Required.** Employees of the Department and all authorized representatives must be permitted access to the project area at all reasonable times for the purpose of inspecting work performed under a notification.

(4) **Archeological Resources.** If any archeological sites, resources or artifacts are discovered during construction, work must immediately cease and the State Historic Preservation Office must be contacted.

(5) **ODFW Fish Passage Requirement.** The noticed activity must meet Oregon Department of Fish and Wildlife requirements for fish passage before the project is started (ORS 509.580 to 509.901 and OAR 635-412-0005 to 0040).

(6) **Hazards to Recreation, Navigation and Fishing.** The activity must be timed so as not to interfere with or create a hazard to recreational and commercial navigation and fishing.

(7) **Work Period in Jurisdictional Areas.** Fill or removal activities below the Ordinary High Water Line must be conducted when recommended by ODFW, unless otherwise coordinated with Oregon Department of Fish and Wildlife and approved in writing by DSL. Work is prohibited when fish eggs are present within the reach where activities are being conducted.

(8) **Pre-Construction Resource Area Fencing or Flagging.** Prior to any site grading, the boundaries of any avoided wetlands, waterways and riparian areas adjacent to the project site must be surrounded by noticeable construction fencing or flagging. There must be no vegetation removal or heavy equipment within marked areas. The marked areas must be maintained during construction of the project and be removed immediately upon project completion.

(9) **Erosion Control Methods.** The following erosion control measures must be installed at the construction site prior to construction and maintained during and after construction to prevent erosion and minimize movement of soil into waters of this state:

(a) All exposed soils must be stabilized during and after construction in order to prevent erosion and sedimentation;

(b) Filter bags, sediment fences, sediment traps or catch basins, leave strips or berms, or other measures must be used to prevent movement of soil into waterways and wetlands;

(c) To prevent erosion, use of compost berms, impervious materials or other equally effective methods, must be used to protect soil stockpiled during rain events or when the stockpile site is not moved or reshaped for more than 48 hours;

(d) Unless part of the permanent fill, all construction access points through, and staging areas in, riparian and wetland areas must use removable pads or mats to prevent soil compaction. However, in some wetland areas under dry summer conditions, this requirement may be waived upon approval by DSL. At project completion, disturbed areas with soil exposed by construction activities must be stabilized by mulching and native vegetative plantings/seeding. Sterile grass may be used instead of native vegetation for temporary sediment control if native vegetation is unavailable. If soils are to remain exposed for more than seven days after completion of the permitted work, they must be covered with erosion control pads, mats or similar erosion control devices until vegetative stabilization is installed;

(e) Where vegetation is used for erosion control on slopes steeper than 2:1, tackified seed mulch must be used so the seed does not wash away before germination and rooting;

(f) Dredged or other excavated material must be placed on upland areas having stable slopes and must be prevented from eroding back into waterways and wetlands;

(g) Erosion control measures must be inspected and maintained as necessary to ensure their continued effectiveness until soils become stabilized; and

(h) All erosion control structures must be removed when the project is complete and soils are stabilized and vegetated.

(10) **Hazardous, Toxic, and Waste Material Handling.** Petroleum products, chemicals, fresh cement, sandblasted material and chipped paint, wood treated with leachable preservatives or other deleterious waste materials must not be allowed to enter waters of this state. Machinery refueling is to occur at least 150 feet from waters of this state and confined in a designated area to prevent spillage into waters of this state. Barges must have a containment system to effectively prevent petroleum

products or other deleterious material from entering waters of this state. Project-related spills into waters of this state or onto land with a potential to enter waters of this state must be reported to the Oregon Emergency Response System (OERS) at 1-800-452-0311.

(11) **Raising or Redirecting Water.** The project must not cause water to rise or be redirected and result in damage to structures or property.

(12) **Wetlands of Conservation Concern.** The project must not involve impacts to wetlands identified as a wetland type of conservation concern. Wetlands of Conservation Concern are bogs, fens, playas, salt flats, alkaline lakes, hot springs, native wet prairies, vernal pools, inter-dunal wetlands, mature forested wetlands, ultramafic soil wetlands, wooded tidal wetlands, and un-diked tidal wetlands, as determined by the Department.

(13) **Waste Disposal.** Old piling and other waste material discarded by the project must be disposed of in an appropriate disposal facility. There must be no temporary storage of piling or other waste material below top of bank, in any wetland, Federal Emergency Management Administration designated floodway, or an area historically subject to landslides.

(14) **DSL May Halt or Modify.** DSL retains the authority to temporarily halt or modify the project in case of unforeseen damage to natural resources.

(15) **Work Area Isolation.** The work area must be isolated from the water during construction. All structures and materials used to isolate the work area must be removed immediately following construction and water flow returned to pre-construction conditions. All fish must be salvaged from the isolated area in accordance with Oregon Department of Fish and Wildlife requirements.

(16) **Spoil Disposal.** Spoil materials, not used in the project, must be placed in an upland location. Spoil materials used in the project must be included in the cumulative removal-fill calculation for the activity.

(17) **Temporary Impact Rectification**. Rectification of temporary impacts includes re-establishment of pre-existing contours and pre-existing vegetation.

(18) **Timing of Temporary Impact Rectification**. Re-establishment of pre-construction contours must be completed immediately following project completion and within the same construction season as the temporary impact. Planting must be completed within six months of re-establishment of pre-existing contours.

(19) **Post-Construction Report Required.** Within two years of planting, a report must be submitted to the Department. The report must include:

(a) Data plots, according to OAR 141-090, to confirm that the wetland area impacted by the project meets wetland criteria; and

(b) Photos taken at the previously established photo points.

(20) **Protection of Ground Surface**. Before placing temporary fill in wetlands, fabric must be placed to allow complete removal of all temporary materials from the wetlands. If necessary to assist with removal of the fill, chain link fence or similar material may be placed under the fill. All fabric, fencing and other materials must be completely removed at project completion.

(21) **Stockpile Topsoil**. When trenching, the upper 12 inches of topsoil must be removed and stockpiled separately from subsurface soils and used as the final layer in backfilling.

(22) **Prevent Hydraulic Piping.** The project must be constructed to prevent underground hydraulic piping to dewater the site or adjacent wetlands. If the native underlying soils are not used as bedding material, and a coarser, non-native soil or other material is used, preventive measures must be used such as restoration of the restrictive layer and placement of clay or other impermeable plugs. Such plugs must be placed at each wetland boundary.

VOLUME 2 - DRAWINGS
(Bound Separately)