



Purchasing Division

Invitation for Bid

IFB-4396-17-DH
Persigo Wastewater Treatment Plant
Diffuser Outfall Improvements Project

Responses Due:

July 27, 2017 prior to 3:30 pm MDT

Accepting Electronic Responses Only

Responses Only Submitted Through the Rocky Mountain E-Purchasing System (RMEPS)

<https://www.rockymountainbidsystem.com/default.asp>

(Purchasing Representative does not have access or control of the vendor side of RMEPS. If website or other problems arise during response submission, vendor **MUST** contact RMEPS to resolve issue prior to the response deadline. 800-835-4603)

Purchasing Representative:

Duane Hoff, Senior Buyer

duaneh@gjcity.org

(970)244-1545

This document has been developed specifically to solicit competitive responses for this solicitation, and may not be the same as previous City of Grand Junction solicitations. All vendors are urged to thoroughly review this solicitation prior to responding. Submittal by **FAX, EMAIL or HARD COPY IS NOT ACCEPTABLE** for this solicitation.

Invitation for Bids

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1. Instructions to Bidders

- 1.1. **Purpose:** The City of Grand Junction is soliciting competitive bids from qualified and interested companies for all labor, equipment, and materials required for the **Persigo WWTP – Diffuser Outfall Improvements Project**. All dimensions and scope of work should be verified by Contractors prior to submission of bids.

IFB Questions:

Duane Hoff, Senior Buyer

970-244-1545

duaneh@gjcity.org

- 1.2. **Mandatory Pre-Bid Meeting:** **Prospective bidders are required to attend the mandatory pre-bid meeting on July 17, 2017 at 10:00 am.** Meeting location will be at the Persigo Wastewater Treatment Plant in the Conference Room, located at 2145 River Road, Grand Junction, CO. This meeting also allows the Owner to know who is planning on submitting a bid for the project. The purpose of this visit will be to inspect and to clarify the contents of this Invitation for Bids (IFB).
- 1.3. **The Owner:** The Owner is the City of Grand Junction, Colorado and is referred to throughout this Solicitation. The term Owner means the Owner or his authorized representative.
- 1.4. **Submission:** **Each bid shall be submitted in electronic format only, and only through the Rocky Mountain E-Purchasing website (<https://www.rockymountainbidssystem.com/default.asp>).** *This site offers both “free” and “paying” registration options that allow for full access of the Owner’s documents and for electronic submission of proposals. (Note: “free” registration may take up to 24 hours to process. Please Plan accordingly.)* Please view our “**Electronic Vendor Registration Guide**” at <http://www.gjcity.org/business-and-economic-development/bids/> for details. (Purchasing Representative does not have access or control of the vendor side of RMEPS. If website or other problems arise during response submission, vendor **MUST** contact RMEPS to resolve issue prior to the response deadline. **800-835-4603**)
- 1.5. **Modification and Withdrawal of Bids Before Opening:** Bids may be modified or withdrawn by an appropriate document stating such, duly executed and submitted to the place where Bids are to be submitted at any time prior to Bid Opening.
- 1.6. **Printed Form for Price Bid:** All Price Bids must be made upon the Price Bid Schedule attached, and should give the amounts both in words and in figures, and must be signed and acknowledged by the bidder.

The Offeror shall specify a unit price in figures for each pay item for which a quantity is given and shall provide the products (in numbers) of the respective unit prices and quantities in the Extended Amount column. The total Bid price shall be equal to the sum of all extended amount prices. When an item in the Price Bid Schedule provides a choice to be made by the Offeror, Offeror's choice shall be indicated in accordance with the specifications for that particular item and thereafter no further choice shall be permitted.

Where the unit of a pay item is lump sum, the lump sum amount shall be shown in the "extended amount" column and included in the summation of the total Bid.

All blank spaces in the Price Bid Schedule must be properly filled out.

Bids by corporations must be executed in the corporate name by the president or vice president or other corporate office accompanied by evidence of authority to sign. The corporate address and state of incorporation shall be shown below the signature.

Bids by partnerships must be executed in the partnership name and signed by a partner whose title must appear under the signature and the official address of the partnership must be shown below the signature.

All names must be typed or printed below the signature.

The Offeror's Bid shall contain an acknowledgement of receipt of all Addenda, the numbers of which shall be filled in on the Contractor's Bid Form.

The contact information to which communications regarding the Bid are to be directed must be shown.

- 1.7. **Exclusions:** No oral, telephonic, emailed, or facsimile bid will be considered
- 1.8. **Contract Documents:** The complete IFB and bidder's response compose the Contract Documents. Copies of bid documents can be obtained from the City Purchasing website, <http://www.gjcity.org/business-and-economic-development/bids/>
- 1.9. **Additional Documents:** The July 2010 edition of the "City Standard Contract Documents for Capital Improvements Construction", Plans, Specifications and other Bid Documents are available for review or download on the Engineering page within Manuals/Permits at www.gjcity.org. Electronic copies may be obtained on a CD format at the Department of Public Works and Utilities at City Hall.
- 1.10. **Definitions and Terms:** See Article I, Section 3 of the General Contract Conditions in the *Standard Contract Documents for Capital Improvements Construction*.
- 1.11. **Examination of Specifications:** Bidders shall thoroughly examine and be familiar with the project Statement of Work. The failure or omission of any Offeror to receive or examine any form, addendum, or other document shall in no way relieve any Offeror from any obligation with respect to his bid. The submission of a bid shall be taken as evidence of compliance with this section. Prior to submitting a bid, each Offeror shall, at a minimum:
 - a. Examine the *Contract Documents* thoroughly;
 - b. Visit the site to familiarize themselves with local conditions that may in any manner affect cost, progress, or performance of the Work;

- c. Become familiar with federal, state, and local laws, ordinances, rules, and regulations that may in any manner affect cost, progress or performance of the Work;
- d. Study and carefully correlate Bidder's observations with the *Contract Documents*, and;
- e. Notify the Engineer of all conflicts, errors, ambiguities or discrepancies in or among the *Contract Documents*

On request, the Owner will provide each Offeror access to the site to conduct such investigations and tests as each Bidder deems necessary for submission of a Bid. It shall be the Offeror's responsibility to make or obtain any additional examinations, investigations, explorations, tests and studies and obtain any additional information and data which pertain to the physical conditions (including without limitation, surface, subsurface and underground utilities) at or contiguous to the site or otherwise which may affect cost, progress or performance of the work and which the Offeror deems necessary to determine its Bid for performing the work in accordance with the time, price and other terms and conditions of the Contract Documents. Location of any excavation or boring made by Offeror shall be subject to prior approval of Owner and applicable agencies. Offeror shall fill all holes, restore all pavements to match the existing structural section and shall clean up and restore the site to its former condition upon completion of such exploration. The Owner reserves the right to require the Offeror to execute an access agreement with the Owner prior to accessing the site.

The lands upon which the Work is to be performed, rights of way, and access thereto, and other lands designated for use by Contractor in performing the Work, are identified on the Drawings.

Information and data reflected in the *Contract Documents* with respect to underground utilities at or contiguous to the site are based upon information and data furnished to the Owner and the Engineer by the owners of such underground utilities or others, and the Owner does not assume responsibility for the accuracy or completeness thereof, unless it is expressly provided otherwise in the *Contract Documents*.

By submission of a Bid, the Offeror shall be conclusively presumed to represent that the Offeror has complied with every requirement of these Instructions to Bidders, that the *Contract Documents* are not ambiguous and are sufficient in scope and detail to indicate and convey understanding of all terms and conditions for performance of the Work.

- 1.12. Questions Regarding Statement of Work:** Any information relative to interpretation of Scope of Work or specifications shall be requested of the Purchasing Representative, in writing, in ample time prior to the response time.
- 1.13. Addenda & Interpretations:** If it becomes necessary to revise any part of this solicitation, a written addendum will be posted electronically on the City's website at <http://www.gjcity.org/business-and-economic-development/bids/>. The Owner is not bound by any oral representations, clarifications, or changes made in the written

specifications by Owner, unless such clarification or change is provided in written addendum form from the City Purchasing Representative.

- 1.14. **Taxes:** The Owner is exempt from State retail and Federal tax. The bid price must be net, exclusive of taxes.
- 1.15. **Sales and Use Taxes:** The Contractor and all Subcontractors are required to obtain exemption certificates from the Colorado Department of Revenue for sales and use taxes in accordance with the provisions of the General Contract Conditions. Bids shall reflect this method of accounting for sales and use taxes on materials, fixtures and equipment.
- 1.16. **Offers Binding 60 Days:** Unless additional time is required by the Owner, or otherwise specified, all formal offers submitted shall be binding for sixty (60) calendar days following opening date, unless the Bidder, upon request of the Purchasing Representative, agrees to an extension.
- 1.17. **Collusion Clause:** Each bidder by submitting a bid certifies that it is not party to any collusive action or any action that may be in violation of the Sherman Antitrust Act. Any and all bids shall be rejected if there is evidence or reason for believing that collusion exists among bidders. The Owner may, or may not, accept future bids for the same services or commodities from participants in such collusion.
- 1.18. **Disqualification of Bidders:** A Bid will not be accepted from, nor shall a Contract be awarded to, any person, firm, or corporation that is in arrears to the Owner, upon debt or contract, or that has defaulted, as surety or otherwise, upon any obligation to the Owner, or that is deemed irresponsible or unreliable.

Bidders may be required to submit satisfactory evidence that they are responsible, have a practical knowledge of the project bid upon and that they have the necessary financial and other resources to complete the proposed Work.

Either of the following reasons, without limitation, shall be considered sufficient to disqualify a Bidder and Bid:

- a. More than one Bid is submitted for the same Work from an individual, firm, or corporation under the same or different name; and
 - b. Evidence of collusion among Bidders. Any participant in such collusion shall not receive recognition as a Bidder for any future work of the Owner until such participant has been reinstated as a qualified bidder.
- 1.19. **Public Disclosure Record:** If the bidder has knowledge of their employee(s) or sub-contractors having an immediate family relationship with a City/County employee or elected official, the bidder must provide the Purchasing Representative with the name(s) of these individuals. These individuals are required to file an acceptable "Public Disclosure Record", a statement of financial interest, before conducting business with the City/County.

2. General Contract Conditions for Construction Projects

- 2.1. The Contract:** This Invitation for Bid, submitted documents, and any negotiations, when properly accepted by the City/County, shall constitute a contract equally binding between the City/County and Contractor. The contract represents the entire and integrated agreement between the parties hereto and supersedes all prior negotiations, representations, or agreements, either written or oral. The contract may be amended or modified with Change Orders, Field Orders, or Addendums.
- 2.2. The Work:** The term Work includes all labor necessary to produce the construction required by the Contract Documents, and all materials and equipment incorporated or to be incorporated in such construction.
- 2.3. Execution, Correlation, Intent, and Interpretations:** The Contract Documents shall be signed in not less than triplicate by the Owner (City/County) and Contractor. City/County will provide the contract. By executing the contract, the Contractor represents that he/she has visited the site, familiarized himself with the local conditions under which the Work is to be performed, and correlated his observations with the requirements of the Contract Documents. The Contract Documents are complementary, and what is required by any one, shall be as binding as if required by all. The intention of the documents is to include all labor, materials, equipment and other items necessary for the proper execution and completion of the scope of work as defined in the technical specifications and drawings contained herein. All drawings, specifications and copies furnished by the City/County are, and shall remain, City/County property. They are not to be used on any other project, and with the exception of one contract set for each party to the contract, are to be returned to the owner on request at the completion of the work.
- 2.4. The Owner:** The Owner is the City of Grand Junction and/or Mesa County, Colorado and is referred to throughout the Contract Documents. The term Owner means the Owner or his authorized representative. The Owner shall, at all times, have access to the work wherever it is in preparation and progress. The Contractor shall provide facilities for such access. The Owner will make periodic visits to the site to familiarize himself generally with the progress and quality of work and to determine, in general, if the work is proceeding in accordance with the contract documents. Based on such observations and the Contractor's Application for Payment, the Owner will determine the amounts owing to the Contractor and will issue Certificates for Payment in such amounts, as provided in the contract. The Owner will have authority to reject work which does not conform to the Contract documents. Whenever, in his reasonable opinion, he considers it necessary or advisable to insure the proper implementation of the intent of the Contract Documents, he will have authority to require the Contractor to stop the work or any portion, or to require special inspection or testing of the work, whether or not such work can be then be fabricated, installed, or completed. The Owner will not be responsible for the acts or omissions of the Contractor, and sub-Contractor, or any of their agents or employees, or any other persons performing any of the work.
- 2.5. Contractor:** The Contractor is the person or organization identified as such in the Agreement and is referred to throughout the Contract Documents. The term Contractor means the Contractor or his authorized representative. The Contractor shall carefully

study and compare the General Contract Conditions of the Contract, Specification and Drawings, Scope of Work, Addenda and Modifications and shall at once report to the Owner any error, inconsistency or omission he may discover. Contractor shall not be liable to the Owner for any damage resulting from such errors, inconsistencies or omissions. The Contractor shall not commence work without clarifying Drawings, Specifications, or Interpretations.

- 2.6. Sub-Contractors:** A sub-contractor is a person or organization who has a direct contract with the Contractor to perform any of the work at the site. The term sub-contractor is referred to throughout the contract documents and means a sub-contractor or his authorized representative.
- 2.7. Award of Sub-Contractors & Other Contracts for Portions of the Work:** Contractor shall submit with their bid response to the Owner, in writing for acceptance, a list of the names of the sub-contractors or other persons or organizations proposed for such portions of the work as may be designated in the proposal requirements, or, if none is so designated, the names of the sub-contractors proposed for the principal portions of the work. Prior to the award of the contract, the Owner shall notify the successful Contractor in writing if, after due investigation, has reasonable objection to any person or organization on such list. If, prior to the award of the contract, the Owner has a reasonable and substantial objection to any person or organization on such list, and refuses in writing to accept such person or organization, the successful Contractor may, prior to the award, withdraw their proposal without forfeiture of proposal security. If the successful Contractor submits an acceptable substitute with an increase in the proposed price to cover the difference in cost occasioned by the substitution, the Owner may, at their discretion, accept the increased proposal or may disqualify the Contractor. If, after the award, the Owner refuses to accept any person or organization on such list, the Contractor shall submit an acceptable substitute and the contract sum shall be increased or decreased by the difference in cost occasioned by such substitution and an appropriate Change Order shall be issued. However, no increase in the contract sum shall be allowed for any such substitution unless the Contractor has acted promptly and responsively in submitting a name with respect thereto prior to the award.
- 2.8. Quantities of Work and Unit Price:** Materials or quantities stated as unit price items in the Bid are supplied only to give an indication of the general scope of the Work, and are as such, estimates only. The Owner does not expressly or by implication agree that the actual amount of Work or material will correspond therewith, and reserves the right after award to increase or decrease the quantity of any unit item of the Work without a change in the unit price except as set forth in Article VIII, Section 70 of the *General Contract Conditions*. The City also reserves the right to make changes in the Work (including the right to delete any bid item in its entirety or add additional bid items) as set forth in Article VIII, Sections 69 through 71 of the *General Contract Conditions*.
- 2.9. Substitutions:** The materials, products and equipment described in the *Solicitation Documents* shall be regarded as establishing a standard of required performance, function, dimension, appearance, or quality to be met by any proposed substitution. No substitution will be considered prior to receipt of Bids unless the Offeror submits a written request for approval to the City Purchasing Division at least ten (10) days prior to the date for receipt of Bids. Such requests for approval shall include the name of the material

or equipment for which substitution is sought and a complete description of the proposed substitution including drawings, performance and test data, and other information necessary for evaluation, including samples if requested. The Offeror shall set forth changes in other materials, equipment, or other portions of the Work including changes of the work of other contracts, which incorporation of the proposed substitution would require to be included. The Owner's decision of approval or disapproval of a proposed substitution shall be final. If the Owner approves a proposed substitution before receipt of Bids, such approval will be set forth in an Addendum. Offerors shall not rely upon approvals made in any other manner.

- 2.10. Supervision and Construction Procedures:** The Contractor shall supervise and direct the work, using his best skill and attention. He shall be solely responsible for all construction means, methods, techniques, sequences and procedures and for coordinating all portions of the work under the contract.
- 2.11. Warranty:** The Contractor warrants to the Owner that all materials and equipment furnished under this contract will be new unless otherwise specified, and that all work will be of good quality, free from faults and defects and in conformance with the Contract Documents. All work not so conforming to these standards may be considered defective. If required by Owner, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment. If within ten (10) days after written notice to the Contractor requesting such repairs or replacement, the Contractor should neglect to make or undertake with due diligence to the same, the City may make such repairs or replacements. All indirect and direct costs of such correction or removal or replacement shall be at the Contractor's expense. The Contractor will also bear the expenses of making good all work of others destroyed or damaged by the correction, removal or replacement of his defective work.
- 2.12. Permits, Fees, & Notices:** The Contractor shall secure and pay for all permits, governmental fees and licenses necessary for the proper execution and completion of the work. The Contractor shall give all notices and comply with all laws, ordinances, rules, regulations and orders of any public authority bearing on the performance of the work. If the Contractor observes that any of the Contract Documents are at variance in any respect, he shall promptly notify the Owner in writing, and any necessary changes shall be adjusted by approximate modification. If the Contractor performs any work knowing it to be contrary to such laws, ordinances, rules and regulations, and without such notice to the Owner, he shall assume full responsibility and shall bear all costs attributable.
- 2.13. Responsibility for Those Performing the Work:** The Contractor shall be responsible to the Owner for the acts and omissions of all his employees and all sub-contractors, their agents and employees, and all other persons performing any of the work under a contract with the Contractor.
- 2.14. Use of the Site:** The Contractor shall confine operations at the site to areas permitted by law, ordinances, permits and the Contract Documents, and shall not unreasonably encumber the site with any materials or equipment.

2.15. Cleanup: The Contractor at all times shall keep the premises free from accumulation of waste materials or rubbish caused by his operations. At the completion of work he shall remove all his waste materials and rubbish from and about the project, as well as all his tools, construction equipment, machinery and surplus materials.

2.16. Insurance: The Contractor shall secure and maintain such insurance policies as will provide the coverage and contain other provisions specified in the General Contract Conditions, or as modified in the Special Contract Conditions.

The Contractor shall file a copy of the policies or Certificates of Insurance acceptable to the City with the Engineer within ten (10) Calendar Days after issuance of the Notice of Award. These Certificates of Insurance shall contain a provision that coverage afforded under the policies shall not be canceled unless at least thirty (30) Calendar Days prior written notice has been given to the City.

2.17. Indemnification: The Contractor shall defend, indemnify and save harmless the Owner, and all its officers, employees, insurers, and self-insurance pool, from and against all liability, suits, actions, or other claims of any character, name and description brought for or on account of any injuries or damages received or sustained by any person, persons, or property on account of any negligent act or fault of the Contractor, or of any Contractor's agent, employee, sub-contractor or supplier in the execution of, or performance under, any contract which may result from proposal award. Contractor shall pay any judgment with cost which may be obtained against the Owner growing out of such injury or damages.

2.18. Miscellaneous Conditions: Material Availability: Contractors must accept responsibility for verification of material availability, production schedules, and other pertinent data prior to submission of bid. It is the responsibility of the bidder to notify the Owner immediately if materials specified are discontinued, replaced, or not available for an extended period of time. OSHA Standards: All bidders agree and warrant that services performed in response to this invitation shall conform to the standards declared by the US Department of Labor under the Occupational Safety and Health Act of 1970 (OSHA). In the event the services do not conform to OSHA standards, the Owner may require the services to be redone at no additional expense to the Owner.

2.19. Time: Time is of the essence with respect to the time of completion of the Project and any other milestones or deadline which are part of the Contract. It will be necessary for each Bidder to satisfy the City of its ability to complete the Work within the Contract Time set forth in the Contract Documents. The Contract Time is the period of time allotted in the Contract Documents for completion of the work. The date of commencement of the work is the date established in a Notice to Proceed. If there is no Notice to Proceed, it shall be the date of the Contract or such other date as may be established therein, or as established as entered on the Bid Form. The Date of Substantial Completion of the work or designated portions thereof is the date certified by the Owner when construction is sufficiently complete, in accordance with the Contract Documents.

2.20. Progress & Completion: The Contractor shall begin work on the date of commencement as defined in the Contract, and shall carry the work forward expeditiously with adequate forces and shall complete it within the contract time.

2.21. Payment & Completion: The Contract Sum is stated in the Contract and is the total amount payable by the Owner to the Contractor for the performance of the work under the Contract Documents. Upon receipt of written notice that the work is ready for final inspection and acceptance and upon receipt of application for payment, the Owner's Project Manager will promptly make such inspection and, when he finds the work acceptable under the Contract Documents and the Contract fully performed, the Owner shall make payment in the manner provided in the Contract Documents.

2.22. Bid Bond: Each Bid shall as a guaranty of good faith on the part of the Bidder be accompanied by a Bid Guaranty consisting of: a certified or cashier's check drawn on an approved national bank or trust company in the state of Colorado, and made payable without condition to the City; or a **Bid Bond** written by an approved corporate surety in favor of the City. The amount of the Bid Guaranty shall not be less than 5% of the total Bid amount. Once a Bid is accepted and a Contract is awarded, the apparent successful bidder has ten calendar days to enter into a contract in the form prescribed and to furnish the bonds with a legally responsible and approved surety. Failure to do so will result in forfeiture of the Bid Guaranty to the City as Liquidated Damages.

Each bidder shall guaranty its total bid price for a period of sixty (60) Calendar Days from the date of the bid opening.

2.23. Performance & Payment Bonds: Contractor shall furnish a Performance and a Payment Bond, each in an amount at least equal to that specified for the contract amount as security for the faithful performance and payment of all Contractor's obligations under the Contract Documents. These bonds shall remain in effect for the duration of the Warranty Period (as specified in the Special Conditions). Contractor shall also furnish other bonds that may be required by the Special Conditions. All bonds shall be in the forms prescribed by the Contract Documents and be executed by such sureties as (1) are licensed to conduct business in the State of Colorado and (2) are named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Audit Staff, Bureau of Accounts, U.S. Treasury Department. All bonds signed by an agent must be accompanied by a certified copy of the Authority Act. If the surety on any bond furnished by the Contractor is declared bankrupt, or becomes insolvent, or its rights to do business in Colorado are terminated, or it ceases to meet the requirements of clauses (1) and (2) of this section, Contractor shall within five (5) days thereafter substitute another bond and surety, both of which shall be acceptable to the City.

2.24. Retention: The Owner will deduct money from the partial payments in amounts considered necessary to protect the interest of the Owner and will retain this money until after completion of the entire contract. The amount to be retained from partial payments will be five (5) percent of the value of the completed work, and not greater than five (5) percent of the amount of the Contract. When the retainage has reached five (5) percent of the amount of the Contract no further retainage will be made and this amount will be retained until such time as final payment is made.

- 2.25. Liquidated Damages for Failure to Enter Into Contract: (CITY ONLY)** Should the Successful Bidder fail or refuse to enter into the Contract within ten Calendar Days from the issuance of the Notice of Award, the City shall be entitled to collect the amount of such Bidder's Bid Guaranty as Liquidated Damages, not as a penalty but in consideration of the mutual release by the City and the Successful Bidder of all claims arising from the City's issuance of the Notice of Award and the Successful Bidder's failure to enter into the Contract and the costs to award the Contract to any other Bidder, to readvertise, or otherwise dispose of the Work as the City may determine best serves its interest.
- 2.26. Liquidated Damages for Failure to Meet Project Completion Schedule: (CITY ONLY)** If the Contractor does not achieve Final Completion by the required date, whether by neglect, refusal or any other reason, the parties agree and stipulate that the Contractor shall pay liquidated damages to the City for each such day that final completion is late. As provided elsewhere, this provision does not apply for delays caused by the City. The date for Final Completion may be extended in writing by the Owner.

The Contractor agrees that as a part of the consideration for the City's awarding of this Contract liquidated damages in the daily amount of **\$350.00** is reasonable and necessary to pay for the actual damages resulting from such delay. The parties agree that the real costs and injury to the City for such delay include hard to quantify items such as: additional engineering, inspection and oversight by the City and its agents; additional contract administration; inability to apply the efforts of those employees to the other work of the City; perceived inefficiency of the City; citizens having to deal with the construction and the Work, rather than having the benefit of a completed Work, on time; inconvenience to the public; loss of reputation and community standing for the City during times when such things are very important and very difficult to maintain.

The Contractor must complete the Work and achieve final completion included under the Bid Schedule in the number of consecutive calendar days after the City gives its written Notice to Proceed. When the Contractor considers the entire Work ready for its intended use, Contractor shall certify in writing that the Work is substantially complete. In addition to the Work being substantially complete, Final Completion date is the date by which the Contractor shall have fully completed all clean-up, and all items that were identified by the City in the inspection for final completion. Unless otherwise stated in the Special Conditions, for purposes of this liquidated damages clause, the Work shall not be finished and the Contract time shall continue to accrue until the City gives its written Final Acceptance.

If the Contractor shall fail to pay said liquidated damages promptly upon demand thereof after having failed to achieve Final Completion on time, the City shall first look to any retainage or other funds from which to pay said liquidated damages; if retainage or other liquid funds are not available to pay said liquidated damages amounts, the Surety on the Contractor's Performance Bond and Payment Bond shall pay such liquidated damages. In addition, the City may withhold all, or any part of, such liquidated damages from any payment otherwise due the Contractor.

Liquidated damages as provided do not include any sums to reimburse the City for extra costs which the City may become obligated to pay on other contracts which were delayed or extended because of the Contractor's failure to complete the Work within the Contract

Time. Should the City incur additional costs because of delays or extensions to other contracts resulting from the Contractor's failure of timely performance, the Contractor agrees to pay these costs that the City incurs because of the Contractor's delay, and these payments are separate from and in addition to any liquidated damages.

The Contractor agrees that the City may use its own forces or hire other parties to obtain Substantial or Final Completion of the work if the time of completion has elapsed and the Contractor is not diligently pursuing completion. In addition to the Liquidated Damages provided for, the Contractor agrees to reimburse the City for all expenses thus incurred.

- 2.27. Contingency/Force Account:** Contingency/Force Account work will be authorized by the Owner's Project Manager and is defined as minor expenses to cover miscellaneous or unforeseen expenses related to the project. The expenses are not included in the Drawings, Specifications, or Scope of Work and are necessary to accomplish the scope of this contract. Contingency/Force Account Authorization will be directed by the Owner through an approved form. Contingency/Force Account funds are the property of the Owner and any Contingency/Force Account funds, not required for project completion, shall remain the property of the Owner. Contractor is not entitled to any Contingency/Force Account funds, that are not authorized by Owner or Owner's Project Manager.
- 2.28. Protection of Persons & Property:** The Contractor shall comply with all applicable laws, ordinances, rules, regulations and orders of any public authority having jurisdiction for the safety of persons or property or to protect them from damage, injury or loss. Contractor shall erect and maintain, as required by existing safeguards for safety and protection, and all reasonable precautions, including posting danger signs or other warnings against hazards promulgating safety regulations and notifying owners and users of adjacent utilities. When or where any direct or indirect damage or injury is done to public or private property by or on account of any act, omission, neglect, or misconduct by the Contractor in the execution of the work, or in consequence of the non-execution thereof by the Contractor, he shall restore, at his own expense, such property to a condition similar or equal to that existing before such damage or injury was done, by repairing, rebuilding, or otherwise restoring as may be directed, or it shall make good such damage or injury in an acceptable manner.
- 2.29. Changes in the Work:** The Owner, without invalidating the contract, may order changes in the work within the general scope of the contract consisting of additions, deletions or other revisions, the contract sum and the contract time being adjusted accordingly. All such changes in the work shall be authorized by Change Order and shall be executed under the applicable conditions of the contract documents. A Change Order is a written order to the Contractor signed by the Owner issued after the execution of the contract, authorizing a change in the work or an adjustment in the contract sum or the contract time. The contract sum and the contract time may be changed only by Change Order.
- 2.30. Claims for Additional Cost or Time:** If the Contractor wishes to make a claim for an increase in the contract sum or an extension in the contract time, he shall give the Owner written notice thereof within a reasonable time after the occurrence of the event giving rise to such claim. This notice shall be given by the Contractor before proceeding to execute the work, except in an emergency endangering life or property in which case the

Contractor shall precede in accordance with the regulations on safety. No such claim shall be valid unless so made. Any change in the contract sum or contract time resulting from such claim shall be authorized by Change Order.

- 2.31. Minor Changes in the Work:** The Owner shall have authority to order minor changes in the work not involving an adjustment in the contract sum or an extension of the contract time and not inconsistent with the intent of the contract documents.
- 2.32. Field Orders:** The Owner may issue written Field Orders which interpret the Contract Documents in accordance with the specifications, or which order minor changes in the work in accordance with the agreement, without change in the contract sum or time. The Contractor shall carry out such Field Orders promptly.
- 2.33. Uncovering & Correction of Work:** The Contractor shall promptly correct all work rejected by the Owner as defective or as failing to conform to the contract documents whether observed before or after substantial completion and whether or not fabricated installed or completed. The Contractor shall bear all costs of correcting such rejected work, including the cost of the Owner's additional services thereby made necessary. If within one (1) year after the date of completion or within such longer period of time as may be prescribed by law or by the terms of any applicable special guarantee required by the contract documents, any of the work found to be defective or not in accordance with the contract documents, the Contractor shall correct it promptly after receipt of a written notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discover of condition. All such defective or non-conforming work under the above paragraphs shall be removed from the site where necessary and the work shall be corrected to comply with the contract documents without cost to the Owner. The Contractor shall bear the cost of making good all work of separate Contractors destroyed or damaged by such removal or correction. If the Owner prefers to accept defective or non-conforming work, he may do so instead of requiring its removal and correction, in which case a Change Order will be issued to reflect an appropriate reduction in the payment or contract sum, or, if the amount is determined after final payment, it shall be paid by the Contractor.
- 2.30. Amendment:** No oral statement of any person shall modify or otherwise change, or affect the terms, conditions or specifications stated in the resulting contract. All amendments to the contract shall be made in writing by the Owner.
- 2.31. Assignment:** The Contractor shall not sell, assign, transfer or convey any contract resulting from this IFB, in whole or in part, without the prior written approval from the Owner.
- 2.32. Compliance with Laws:** Bids must comply with all Federal, State, County and local laws governing or covering this type of service and the fulfillment of all ADA (Americans with Disabilities Act) requirements.
- 2.33. Confidentiality:** All information disclosed by the Owner to the Contractor for the purpose of the work to be done or information that comes to the attention of the Contractor during the course of performing such work is to be kept strictly confidential.

- 2.34. Conflict of Interest:** No public official and/or City/County employee shall have interest in any contract resulting from this IFB.
- 2.35. Contract Termination:** This contract shall remain in effect until any of the following occurs: (1) contract expires; (2) completion of services; (3) acceptance of services or, (4) for convenience terminated by either party with a written *Notice of Cancellation* stating therein the reasons for such cancellation and the effective date of cancellation.
- 2.36. Employment Discrimination:** During the performance of any services per agreement with the Owner, the Contractor, by submitting a Bid, agrees to the following conditions:
- 2.36.1.** The Contractor shall not discriminate against any employee or applicant for employment because of race, religion, color, sex, age, handicap, or national origin except when such condition is a legitimate occupational qualification reasonably necessary for the normal operations of the Contractor. The Contractor agrees to post in conspicuous places, visible to employees and applicants for employment, notices setting forth the provisions of this nondiscrimination clause.
- 2.36.2.** The Contractor, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, shall state that such Contractor is an Equal Opportunity Employer.
- 2.36.3.** Notices, advertisements, and solicitations placed in accordance with federal law, rule, or regulation shall be deemed sufficient for the purpose of meeting the requirements of this section.
- 2.37. Affirmative Action:** In executing a Contract with the City, the Contractor agrees to comply with Affirmative Action and Equal Employment Opportunity regulations presented in the General Contract Conditions.
- 2.38. Immigration Reform and Control Act of 1986 and Immigration Compliance:** The Offeror certifies that it does not and will not during the performance of the contract employ illegal alien workers or otherwise violate the provisions of the Federal Immigration Reform and Control Act of 1986 and/or the immigration compliance requirements of State of Colorado C.R.S. § 8-17.5-101, *et.seq.* (House Bill 06-1343).
- 2.39. Ethics:** The Contractor shall not accept or offer gifts or anything of value nor enter into any business arrangement with any employee, official, or agent of the Owner.
- 2.40. Failure to Deliver:** In the event of failure of the Contractor to deliver services in accordance with the contract terms and conditions, the Owner, after due oral or written notice, may procure the services from other sources and hold the Contractor responsible for any costs resulting in additional purchase and administrative services. This remedy shall be in addition to any other remedies that the Owner may have.
- 2.41. Failure to Enforce:** Failure by the Owner at any time to enforce the provisions of the contract shall not be construed as a waiver of any such provisions. Such failure to

enforce shall not affect the validity of the contract or any part thereof or the right of the Owner to enforce any provision at any time in accordance with its terms.

- 2.42. Force Majeure:** The Contractor shall not be held responsible for failure to perform the duties and responsibilities imposed by the contract due to legal strikes, fires, riots, rebellions, and acts of God beyond the control of the Contractor, unless otherwise specified in the contract.
- 2.43. Independent Contractor:** The Contractor shall be legally considered an Independent Contractor and neither the Contractor nor its employees shall, under any circumstances, be considered servants or agents of the Owner. The Owner shall be at no time legally responsible for any negligence or other wrongdoing by the Contractor, its servants, or agents. The Owner shall not withhold from the contract payments to the Contractor any federal or state unemployment taxes, federal or state income taxes, Social Security Tax or any other amounts for benefits to the Contractor. Further, the Owner shall not provide to the Contractor any insurance coverage or other benefits, including Workers' Compensation, normally provided by the Owner for its employees.
- 2.44. Nonconforming Terms and Conditions:** A bid that includes terms and conditions that do not conform to the terms and conditions of this Invitation for Bid is subject to rejection as non-responsive. The Owner reserves the right to permit the Contractor to withdraw nonconforming terms and conditions from its bid prior to a determination by the Owner of non-responsiveness based on the submission of nonconforming terms and conditions.

Items for non-responsiveness may include, but not be limited to:

- a. Submission of the Bid on forms other than those supplied by the City;
- b. Alteration, interlineation, erasure, or partial detachment of any part of the forms which are supplied herein;
- c. Inclusion of unauthorized additions conditional or alternate Bids or irregularities of any kind which may tend to make the Bid incomplete, indefinite, or ambiguous as to its meaning;
- d. Failure to acknowledge receipt of any or all issued Addenda;
- e. Failure to provide a unit price or a lump sum price, as appropriate, for each pay item listed except in the case of authorized alternative pay items;
- f. Failure to list the names of Subcontractors used in the Bid preparation as may be required in the Solicitation Documents;
- g. Submission of a Bid that, in the opinion of the Owner, is unbalanced so that each item does not reasonably carry its own proportion of cost or which contains inadequate or unreasonable prices for any item;
- h. Tying of the Bid with any other bid or contract; and

- i. Failure to calculate Bid prices as described herein.

2.45. Evaluation of Bids and Offerors: The Owner reserves the right to:

- reject any and all Bids,
- waive any and all informalities,
- negotiate final terms with the Successful Bidder, and
- disregard any and all nonconforming, nonresponsive or conditional Bids.

Discrepancies between words and figures will be resolved in favor of words. Discrepancies between Unit Prices and Extended Prices will be resolved in favor of the Unit Prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum. The corrected extensions and totals will be shown in the tabulation of Bids.

The Owner may consider the qualifications and experience of Subcontractors and other persons and organizations (including those who are to furnish the principal items of material or equipment) proposed for those portions of the work as to which the identity of Subcontractors and other persons and organizations must be submitted. Operating costs, maintenance considerations performance data, and guarantees of materials and equipment may also be considered by the Owner.

The Owner will conduct such investigations as deemed necessary to assist in the evaluation of any Bid and to establish the responsibility, qualifications and financial ability of the Offeror, proposed Subcontractors and other persons and organizations to do the Work in accordance with the *Contract Documents* to the City's satisfaction within the Contract Time.

The Offeror shall furnish the Owner all information and data requested by the Owner to determine the ability of the Offeror to perform the Work. The Owner reserves the right to reject the Bid if the evidence submitted by, or investigation of such Offeror fails to satisfy the Owner that such Offeror is properly qualified to carry out the obligations of the Contract and to complete the Work contemplated therein.

By submitting a Bid, each Offeror authorizes the Owner to perform such investigation of the Offeror as the Owner deems necessary to establish the responsibility, qualifications and financial ability of the Offeror and, by its signature thereon, authorizes the Owner to obtain reference information concerning the Offeror and releases the party providing such information and the Owner from any and all liability to the Offeror as a result of such reference information so provided.

The Owner reserves the right to reject the Bid of any Offeror who does not pass any evaluation to the Owner's satisfaction.

If the Contract is to be awarded, it will be awarded to the Offeror who, by evaluation, the Owner determines will best meet the Owner's interests.

The Owner reserves the right to accept or reject the Work contained in any of the Price Bid Schedules or alternates, either in whole or in part.

2.46. Award of Contract: Unless otherwise indicated, a single award will be made for all the bid items in an individual bid schedule. In the event that the Work is contained in more than one Bid Schedule, the City may award Schedules individually or in combination. In the case of two Bid Schedules which are alternative to each other, only one of such alternative Schedules will be awarded. Within forty-five (45) Calendar Days of Bid Opening, the City will issue a Notice of Award to the Successful Bidder which will be accompanied by four (4) unsigned copies of the Contract and the Performance and Payment Bond forms. Within ten (10) Calendar Days thereafter, the Successful Bidder shall sign and deliver four (4) copies of the Contract, Performance Bond, Payment Bond and Certificates of Insurance to the City. Within ten (10) Calendar Days thereafter, the City will deliver two (2) fully executed counterparts of the Contract to the Contractor. No contract shall exist between the Successful Bidder and the City and the Successful Bidder shall have no rights at law or in equity until the Contract has been duly executed by the City.

The Successful Bidder's failure to sign and submit a Contract and other documents set forth in this Paragraph within the prescribed time shall be just cause of annulment of the award, and forfeiture of the Bid Guaranty. The award of Contract may then be made to the next qualified Bidder in the same manner as previously prescribed.

2.47. Ownership: All plans, prints, designs, concepts, etc., shall become the property of the Owner.

2.48. Oral Statements: No oral statement of any person shall modify or otherwise affect the terms, conditions, or specifications stated in this document and/or resulting agreement. All modifications to this request and any agreement must be made in writing by the Owner.

2.49. Patents/Copyrights: The Contractor agrees to protect the Owner from any claims involving infringements of patents and/or copyrights. In no event shall the Owner be liable to the Contractor for any/all suits arising on the grounds of patent(s)/copyright(s) infringement. Patent/copyright infringement shall null and void any agreement resulting from response to this IFB.

2.50. Remedies: The Contractor and Owner agree that both parties have all rights, duties, and remedies available as stated in the Uniform Commercial Code.

2.51. Venue: Any agreement as a result of responding to this IFB shall be deemed to have been made in, and shall be construed and interpreted in accordance with, the laws of the City of Grand Junction, Mesa County, Colorado.

2.52. Expenses: Expenses incurred in preparation, submission and presentation of this IFB are the responsibility of the company and cannot be charged to the Owner.

2.53. Sovereign Immunity: The Owner specifically reserves its right to sovereign immunity pursuant to Colorado State Law as a defense to any action arising in conjunction to this agreement.

2.54. Non-Appropriation of Funds: The contractual obligation of the Owner under this contract is contingent upon the availability of appropriated funds from this fiscal year budget as approved by the City Council or Board of County Commissioners from this fiscal year only. State of Colorado Statutes prohibit obligation of public funds beyond the fiscal year for which the budget was approved. Anticipated expenditures/obligations beyond the end of the current Owner's fiscal year budget shall be subject to budget approval. Any contract will be subject to and must contain a governmental non-appropriation of funds clause.

2.55. Cooperative Purchasing: Purchases as a result of this solicitation are primarily for the City/County. Other governmental entities may be extended the opportunity to utilize the resultant contract award with the agreement of the successful provider and the participating agencies. All participating entities will be required to abide by the specifications, terms, conditions and pricings established in this Bid. The quantities furnished in this bid document are for only the City/County. It does not include quantities for any other jurisdiction. The City or County will be responsible only for the award for its jurisdiction. Other participating entities will place their own awards on their respective Purchase Orders through their purchasing office or use their purchasing card for purchase/payment as authorized or agreed upon between the provider and the individual entity. The City/County accepts no liability for payment of orders placed by other participating jurisdictions that choose to piggy-back on our solicitation. Orders placed by participating jurisdictions under the terms of this solicitation will indicate their specific delivery and invoicing instructions.

2.56. Keep Jobs in Colorado Act: Contractor shall be responsible for ensuring compliance with Article 17 of Title 8, Colorado Revised Statutes requiring 80% Colorado labor to be employed on public works. Contractor shall, upon reasonable notice provided by the Owner, permit the Owner to inspect documentation of identification and residency required by C.R.S. §8-17-101(2)(a). If Contractor claims it is entitled to a waiver pursuant to C.R.S. §8-17-101(1), Contractor shall state that there is insufficient Colorado labor to perform the work such that compliance with Article 17 would create an undue burden that would substantially prevent a project from proceeding to completion, and shall include evidence demonstrating the insufficiency and undue burden in its response.

Unless expressly granted a waiver by the Owner pursuant to C.R.S. §8-17-101(1), Contractor shall be responsible for ensuring compliance with Article 17 of Title 8, Colorado Revised Statutes requiring 80% Colorado labor to be employed on public works. Contractor shall, upon reasonable notice provided by the Owner, permit the Owner to inspect documentation of identification and residency required by C.R.S. §8-17-101(2)(a).

2.56.1. "Public project" is defined as:

- (a) any construction, alteration, repair, demolition, or improvement of any land, building, structure, facility, road, highway, bridge, or other public improvement suitable for and intended for use in the promotion of the public health, welfare, or safety and any maintenance programs for the upkeep of such projects

- (b) for which appropriate or expenditure of moneys may be reasonably expected to be \$500,000.00 or more in the aggregate for any fiscal year
- (c) except any project that receives federal moneys.

3. Statement of Work

3.1. GENERAL: The City of Grand Junction is soliciting competitive bids from qualified and interested companies for all labor, equipment, and materials required for the **Persigo WWTP – Diffuser Outfall Improvements Project**. All dimensions and scope of work should be verified by Contractors prior to submission of bids.

3.2. PROJECT DESCRIPTION: The Project generally includes approximately 2,000 linear feet of 48” RCP and 54” HDPE, with a section requiring a 60” diameter bore under Interstate 70 (I-70), seven 90” diameter manholes, new concrete effluent box, removal and abandonment of the existing effluent outfall, native seeding, and a new 54” diameter HDPE diffuser outfall in the Colorado River.

3.3. SPECIAL CONDITIONS:

3.3.1 Mandatory Pre-Bid Meeting: Prospective bidders are required to attend the mandatory pre-bid meeting on July 17, 2017 at 10:00 am. Meeting location will be at the Persigo Wastewater Treatment Plant in the Conference Room, located at 2145 River Road, Grand Junction, CO. This meeting also allows the Owner to know who is planning on submitting a bid for the project. The purpose of this visit will be to inspect and to clarify the contents of this Invitation for Bids (IFB).

3.3.2 QUESTIONS REGARDING SOLICIATION PROCESS/SCOPE OF WORK:

Duane Hoff Jr., Senior Buyer
City of Grand Junction
duaneh@gjcity.org

3.3.3 Project Manager: The Project Manager for the Project is Lee Cooper, Project Engineer, who can be reached at (970) 256-4155. During Construction, all notices, letters, submittals, and other communications directed to the City shall be addressed and mailed or delivered to:

City of Grand Junction
Department of Public Works and Utilities
Attn: Lee Cooper, Project Engineer
2145 River Road
Grand Junction, CO 81505

3.3.4 Affirmative Action: The Contractor is not required to submit a written Affirmative Action Program for the Project.

3.3.5 Pricing: Pricing shall be all inclusive to include but not be limited to: all labor, equipment, supplies, materials, freight (F.O.B. Destination – Freight Pre-paid and Allowed to each site), travel, mobilization costs, fuel, set-up and take down costs, and full-time inspection costs, and all other costs related to the successful

completion of the project.

The Owner shall not pay nor be liable for any other additional costs including but not limited to: taxes, shipping charges, insurance, interest, penalties, termination payments, attorney fees, liquidated damages, etc.

3.3.6 Freight/Shipping: All freight/shipping shall be F.O.B. Destination – Freight Pre-Paid and Allowed to the project site(s), Grand Junction, CO.

3.3.7 Contractor must meet all federal, state, and local rules, regulations, and requirements for providing such services.

3.3.8 Contract: A binding contract shall consist of: (1) the IFB and any amendments thereto, (2) the bidder's response (bid) to the IFB, (3) clarification of the bid, if any, and (4) the City's Purchasing Department's acceptance of the bid by "Notice of Award" or by "Purchase Order". All Exhibits and Attachments included In the IFB shall be incorporated into the contract by reference.

A. The contract expresses the complete agreement of the parties and, performance shall be governed solely by the specifications and requirements contained therein.

B. Any change to the contract, whether by modification and/or supplementation, must be accomplished by a formal contract amendment signed and approved by and between the duly authorized representative of the bidder and the City Purchasing Division or by a modified Purchase Order prior to the effective date of such modification. The bidder expressly and explicitly understands and agrees that no other method and/or no other document, including acts and oral communications by or from any person, shall be used or construed as an amendment or modification to the contract.

3.3.9 Time of Completion: The scheduled time of Completion for the Project is **82 Calendar Days** from the starting date specified in the Notice to Proceed.

Completion is achieved when site cleanup and all punch list items (resulting from the final inspection) have been completed. Completion shall have the meaning set forth in Article I, Section 3 (Definitions and Terms) of the General Contract Conditions.

3.3.10 Working Days and Hours: The Contractor is permitted to work five (5) days per week, Monday through Friday, up to 9 hours per day 7:00 am to 5:00 pm. The City will allow weekend work to happen during construction and installation of the diffuser in the Colorado River channel only. Other work hours and days may be allowed by the City upon 48 hours written notice.

Emergency work may be done without prior consent provided the Contractor notifies the Project Engineer prior to beginning the work.

3.3.11 Licenses and Permits: Contractor is responsible for obtaining all necessary licenses and permits required for Construction, at Contractors expense. See

Section 2.12. Contractor shall supply to Owner all copies of finalized permits.

3.3.12 Permits: The following permits are required for the Project and will be obtained by the City at no cost to the Contractor:

- U.S. Army Corps Nationwide 404 Permit (*Received*)
- Colorado Dept. of Transportation (CDOT) Access/Utility Permit
- Colorado Dept. of Public Health & Environment – *Construction Stormwater Discharge Permit* – Stormwater permit will be transferred to the Contractor after a construction contract has been fully executed.
- Colorado Dept. of Public Health & Environment – *Effluent Discharge Permit*

The following permits are required for the Project and shall be obtained and paid for by the Contractor, with the costs included in the total bid price for the Project:

- Colorado Dept. of Public Health & Environment – *Construction Dewatering Permit*

3.3.13 City Furnished Materials: The City will furnish the following materials for the Project:

- AutoCAD drawings for survey stakeout

3.3.14 Project Newsletters: Not applicable to Project.

3.3.15 Project Sign: Project signs, if any, will be furnished and installed by the City.

3.3.16 Authorized Representatives of the City: Those authorized to represent the City shall include Purchasing Agent, Engineers, and Inspectors employed by the City, only.

3.3.17 Stockpiling Materials and Equipment: The Contractor shall stockpile and store materials and equipment within the Permanent and Temporary Easements as shown on the construction plans. The Contractor shall have the boundaries of the easements staked by their surveyor so the construction limits are clearly marked. The Contractor shall keep all construction activities within these easement boundaries at all times.

The Contractor is not allowed to stockpile, stage, or store construction equipment and materials within Colorado Dept. of Transportation (CDOT) Right-of-Way along Interstate 70.

The projects construction footprint on the Colorado Parks and Wildlife property needs to be kept as confined as possible, while still allowing construction activities to be successfully completed.

3.3.18 Traffic Control: The Contractor shall provide and maintain traffic control in accordance with the approved Traffic Control Plan and the Manual on Uniform Traffic Control Devices. A Traffic Control Plan shall be prepared by the Contractor

and reviewed by the City and CDOT. The traffic control plan shall be submitted to the City before or at the pre-construction meeting.

The traffic control submittal shall include Methods of Handling Traffic (MHT) for both Interstate 70 westbound and eastbound. The traffic control plan shall also include a detour route around the project area in the worst case scenario that the interstate has to be closed down for roadway repairs due to the boring operation.

Refer to Specification 02612 – Steel Pipe and Fittings, Section 3.1.D, for additional information on what will be required of the Contractor for the boring operation under I-70.

2.3.19 Traffic Detector Loops: Not applicable to Project.

3.3.20 Clean-Up: The Contractor shall clear the construction site of all trash and on-site waste daily, including scrap from construction materials. The costs for all clean-up work shall be considered incidental and will not be paid for separately.

3.3.21 Quality Control Testing: See Project Specifications in Appendix B for information. The City will hire a 3rd party Quality Assurance testing agency for backfill compaction testing, concrete testing, and any other tests that are deemed necessary.

3.3.22 Uranium Mill Tailings: It is anticipated that radioactive mill tailings will not be encountered on this Project.

3.3.23 Fugitive Petroleum or Other Contamination: It is anticipated that soil contamination from fugitive petroleum or other contaminants will not be encountered with the Project.

3.3.24 Excess Material: All excess materials shall be disposed in accordance with General Contract Condition Section 50.

3.3.25 Construction Equipment Storage: The Contractor shall stockpile and store materials and equipment within the Permanent and Temporary Easements as shown on the construction plans. The Contractor shall have the boundaries of the easements staked by their surveyor so the construction limits are clearly marked. The Contractor shall keep all construction activities within these easement boundaries at all times.

The Contractor is not allowed to stockpile, stage, or store construction equipment and materials within Colorado Dept. of Transportation (CDOT) Right-of-Way along Interstate 70.

3.3.26 Asphalt Removal and Temporary Asphalt Millings: Not applicable to Project.

3.3.27 Schedule of Submittals: See Appendix A for list of required submittals. The Contractor at a minimum shall deliver these submittals at the pre-construction meeting:

- Construction schedule submitted at or prior to the pre-construction meeting and updated as necessary to reflect actual conditions
- List of contacts for contractor and any subcontractors
- Hourly rate table for labor and equipment to be used on this project
- Method for Handling Traffic (MHT) along Interstate 70, as well as, a proposed detour (closure plan) in the case traffic has to be diverted due to the project.

3.3.28 Existing Utilities and Structures: The location of existing utilities and structures shown on the Plans are approximate. It is the responsibility of the Contractor to locate and protect all structures and utilities in accordance with General Contract Condition Section 37. The Contractor shall coordinate with the utility companies any necessary relocation of utilities and schedule his work accordingly.

3.3.29 Incidental Items: Any item of work not specifically identified or paid for directly, but which is necessary for the satisfactory completion of any paid items of work, will be considered as incidental to those items, and will be included in the cost of those items.

3.3.30 Confined Space Entry: The Contractor is responsible for providing any and all confined space entry safety equipment; including, but not limited to: air testing equipment, fresh air blowers, tripods, harnesses, and SCBA equipment. The Contractor's air monitoring devices shall be calibrated and certified. The cost for all confined space entry equipment shall be incidental to the project cost, and will not be paid for separately.

3.3.31 Domestic (Potable) Water: The Contractor will be responsible for supplying all potable water that will be used on the project for construction purposes. Ute Water fire hydrants are located on Persigo property and may be used as a water source with permission from Ute Water and the installation of backflow safety devices.

The Contractor will be allowed to use Persigo plant water (treated wastewater) for moisture-conditioning soil and dust control operations only. Persigo plant water shall not be used during concrete placement operations.

3.3.32 Bypass Pumping: Bypass pumping of the treated effluent water during the construction of the new concrete effluent box will be required. The Contractor will be required to provide onsite monitoring of the bypass pumping 24 hours a day while the pumping operations are running. Contractor will be required to provide backup controls, 48-Inch pipe plug, power equipment, suction and discharge piping, diesel fuel, pumps and all required equipment for continuous operations of the bypass pumping system.

Monthly average effluent flows, as well as, monthly peak effluent flows are provided in Appendix D. These effluent flows are from the past three years for the months of September, October and November.

The bypass pumping discharge pipe(s) shall discharge into Persigo Wash next to the existing concrete headwall.

The contractor is responsible for all calculations in properly sizing the suction and discharge pipes, and sizing the pump(s) for bypassing the effluent water around the work area. The contractor shall include in the Bypass Pumping pay item the materials and work necessary for blocking the existing opening into the effluent box immediately downstream of the Plant Water Building.

The Contractor has a maximum of **7-calendar days** for continuous bypass pumping that is paid for Lump Sum. These 7-calendar days do not include the time it takes to setup and teardown the pumping assembly. Additional days of bypass pumping beyond the 7- calendar days shall be paid for by the Contractor at no expense to the Owner.

The City will be responsible for dismantling the aluminum safety railing at the effluent building so it doesn't interfere with the bypass suction piping.

3.3.33 Existing River Dike: The existing river dike along the south end of the Persigo WWTP property will need to be graded back to existing condition elevations and slopes, and the trench backfill material shall be moisture conditioned and compacted per the project specifications. The existing river dike is located along the new effluent pipeline alignment between SSMH-011 to SSMH-014.

3.3.34 Existing Persigo Effluent Outlet Pipe and Structure: The Contractor needs to know that the existing effluent pipe (48" dia.) and headwall structure shall remain in service and undisturbed until the State of Colorado gives final acceptance on the new diffuser system and pipeline.

Once the new diffuser and pipeline are complete, the Owner and the State will perform a color dye test on the diffuser. At this time, the effluent water will need to be diverted into the new diffuser pipeline and the Owner will add color dye to the effluent water in order to verify that all seventeen (17) diffusers are working properly out in the river. The color dye test will need to be performed when the Colorado River water is clear and at a low level.

The Owner anticipates that the diffuser color dye test will be performed while the bypass pumping assembly is setup and operational. Contractor shall include color dye testing in their construction schedule in order to accommodate the testing while the bypass pumping assembly is setup.

Only when the State of Colorado gives the Owner final approval and acceptance of the diffuser will the Contractor be allowed to start dismantling and abandoning the existing outfall structures and pipeline. At this time, all effluent flow shall be flowing out to the river diffuser.

3.4. SCOPE OF WORK & SPECIFICATIONS: See Project Manual and Construction Plans.

3.5. Attachments:

Appendix A: Project Submittal Form

Appendix B: Project Manual

Appendix C: USGS Colorado River flows – Daily Average River Flows

Appendix D: Persigo WWTP Historical Effluent Flows

3.6. Contractor Bid Documents: For Contractor's convenience, the following is a list of forms/items to be submitted with the Contractor's bid response. However, should a form/item not be listed in this section, but required in the solicitation documents, it is the Contractor's responsibility to ensure all forms/items are submitted.

- **Contractor's Bid Form**
- **Contractor's Bid Bond**
- **Price Bid Schedule**
- **Sub Contractors Form**

3.7. IFB TENTATIVE TIME SCHEDULE:

Invitation for Bids available:	June 30, 2017
Mandatory Pre-Bid Meeting:	July 17, 2017
Inquiry deadline, no questions after this date:	July 20, 2017
Addendum Posted:	July 24, 2017
Submittal deadline for proposals (Bid Opening):	July 27, 2017
City Council Approval:	August 16, 2017
Notice of Award & Contract execution:	August 17, 2017
Bonding & Insurance Cert. due:	August 30, 2017
Preconstruction meeting:	August 30, 2017
Work begins:	September 11, 2017
Final Completion:	82 Calendar Days from Notice to Proceed (December 1, 2017)

4. Contractor's Bid Form

Bid Date: _____

Project: IFB-4396-17-DH "Persigo Wastewater Treatment Plant Diffuser Outfall Improvements Project"

Bidding Company: _____

Name of Authorized Agent: _____

Email _____

Telephone _____ **Address** _____

City _____ **State** _____ **Zip** _____

The undersigned Bidder, in compliance with the Invitation for Bids, having examined the Instruction to Bidders, General Contract Conditions, Statement of Work, Specifications, and any and all Addenda thereto, having investigated the location of, and conditions affecting the proposed work, hereby proposes to furnish all labor, materials and supplies, and to perform all work for the Project in accordance with Contract Documents, within the time set forth and at the prices stated below. These prices are to cover all expenses incurred in performing the work required under the Contract Documents, of which this Contractor's Bid Form is a part.

The undersigned Contractor does hereby declare and stipulate that this offer is made in good faith without collusion or connection to any person(s) providing an offer for the same work, and that it is made in pursuance of, and subject to, all terms and conditions of the Instructions to Bidders, the Specifications, and all other Solicitation Documents, all of which have been examined by the undersigned.

The Contractor also agrees that if awarded the Contract, to provide insurance certificates within ten (10) working days of the date of Notification of Award. Submittal of this offer will be taken by the Owner as a binding covenant that the Contractor will be prepared to complete the project in its entirety.

The Owner reserves the right to make the award on the basis of the offer deemed most favorable, to waive any formalities or technicalities and to reject any or all offers. It is further agreed that this offer may not be withdrawn for a period of sixty (60) calendar days after closing time. Submission of clarifications and revised offers automatically establish a new thirty day (30) period.

Prices in the bid proposal have not knowingly been disclosed with another provider and will not be prior to award.

- Prices in this bid proposal have been arrived at independently, without consultation, communication or agreement for the purpose of restricting competition.
- No attempt has been made nor will be to induce any other person or firm to submit a bid proposal for the purpose of restricting competition.
- The individual signing this bid proposal certifies they are a legal agent of the offeror, authorized to represent the offeror and is legally responsible for the offer with regard to supporting documentation and prices provided.
- Direct purchases by the City of Grand Junction are tax exempt from Colorado Sales or Use Tax. Tax exempt No. 98-903544. The undersigned certifies that no Federal, State, County or Municipal tax will be added to the above quoted prices.
- Prompt payment discount of _____ percent of the net dollar will be offered to the Owner if the invoice is paid within _____ days after the receipt of the invoice. Payment Terms _____.

RECEIPT OF ADDENDA: the undersigned Contractor acknowledges receipt of Addenda to the Solicitation, Specifications, and other Contract Documents.

State number of Addenda received: _____.

It is the responsibility of the Bidder to ensure all Addenda have been received and acknowledged.

By signing below, the Undersigned agree to comply with all terms and conditions contained herein.

Company: _____

Authorized Signature: _____

Title: _____

Bid Schedule: Persigo WWTP - Diffuser Outfall Improvements Project

Item No.	CDOT, City Ref.	Description	Quantity	Units	Unit Price	Total Price
1	201, 01025	Clearing and Grubbing	1.	Lump Sum	\$ _____	\$ _____
2	202, 01025	Removal of Fence (Southwest Corner of the Persigo Property near SSMH-0014)	50.	Lin. Ft.	\$ _____	\$ _____
3	207, 01025	Topsoil	2,500.	Cu. Yd.	\$ _____	\$ _____
4	207, 01025	Stockpile Topsoil	2,500.	Cu. Yd.	\$ _____	\$ _____
5	208, 01025	Silt Fence	250.	Lin. Ft.	\$ _____	\$ _____
6	208, 01025	Erosion Log Type 1 (20 Inch)	250.	Lin. Ft.	\$ _____	\$ _____
7	208, 01025	Temporary Berms	4,000.	Lin. Ft.	\$ _____	\$ _____
8	208, 01025	Soil Lifts (3' High) (Includes Soil Retention Blanket, Topsoil, Fill, Stakes/Staples)	100.	Lin. Ft.	\$ _____	\$ _____
9	208, 01025	Storm Drain Inlet Protection (Type 1)	20.	Lin. Ft.	\$ _____	\$ _____
10	208, 01025	Sediment Trap	3.	Each	\$ _____	\$ _____
11	208, 01025	Pre-fabricated Concrete Washout Structure	2.	Each	\$ _____	\$ _____
12	208, 01025	Vehicle Tracking Pad	2.	Each	\$ _____	\$ _____
13	208, 01025	Erosion Control Management (ECM)	1.	Lump Sum	\$ _____	\$ _____
14	208, 01025	Temporary Diversion (Coffer Dam) (Colorado River)	500.	Lin. Ft.	\$ _____	\$ _____
15	208, 01025	Temporary Stream Crossing (Persigo Wash)	1.	Lump Sum	\$ _____	\$ _____
16	212, 02935	Seeding (Native)	4.1	Acre	\$ _____	\$ _____
17	212, 02935	Soil Conditioning	4.1	Acre	\$ _____	\$ _____
18	213	Mulching (Hydraulic)	4.1	Acre	\$ _____	\$ _____

Bid Schedule: Persigo WWTP - Diffuser Outfall Improvements Project

Item No.	CDOT, City Ref.	Description	Quantity	Units	Unit Price	Total Price
19	214, 01025	Landscape Maintenance (One-Year from Landscape Completion)	1.	Lump Sum	\$ _____	\$ _____
20	506, 01025	Riprap (D ₅₀ = 9 Inch)	120.	Cu. Yd.	\$ _____	\$ _____
21	607, 01025	Fence Double Gate (6' High) (Chain-Link, Barbed Wire Top, Top Rail) (Southwest Corner of the Persigo Property near SSMH-0014)	24.	Lin. Ft.	\$ _____	\$ _____
22	01025, 02612	Furnish and Install 60" I.D. Steel Pipe Casing (Trenchless)	420.	Lin. Ft.	\$ _____	\$ _____
23	01025, 15064	Furnish and Install 54" O.D. HDPE Pipe	720.	Lin. Ft.	\$ _____	\$ _____
24	01025, 15074	Furnish and Install 48" RCP Pipe	1,250.	Lin. Ft.	\$ _____	\$ _____
25	604, 01025	Manhole Slab Base (10 Foot)	4.	Each	\$ _____	\$ _____
26	604, 01025	Manhole Slab Base (15 Foot)	2.	Each	\$ _____	\$ _____
27	604, 01025	Manhole Slab Base (20 Foot)	1.	Each	\$ _____	\$ _____
28	01025, 03300	Effluent Box	1.	Lump Sum	\$ _____	\$ _____
29	01025, 11001	Diffuser Structure	1.	Lump Sum	\$ _____	\$ _____
30	202, 01025	Remove 24 LF Existing Effluent Pipe and Headwall	1.	Lump Sum	\$ _____	\$ _____
31	01025, 02300	Abandon Effluent Pipe in Place (Includes Flow-fill)	1.	Lump Sum	\$ _____	\$ _____
32	01025	Cleanup and Restoration	1.	Lump Sum	\$ _____	\$ _____
33	01025	Rock Excavation (Bedrock)	200.	Cu. Yd.	\$ _____	\$ _____
34	01025	Bypass Pumping (Effluent Flows) (7-Calendar Days) (Includes 48" pipe plug)	1.	Lump Sum	\$ _____	\$ _____
35	620	Sanitary Facility	2.	Each	\$ _____	\$ _____
36	625	Construction Surveying	1.	Lump Sum	\$ _____	\$ _____

Bid Schedule: Persigo WWTP - Diffuser Outfall Improvements Project

Item No.	CDOT, City Ref.	Description	Quantity	Units	Unit Price	Total Price
37	629	Survey Monumentation (Complete in Place)	1.	Each	\$ _____	\$ _____
38	01025	Mobilization and Demobilization	1.	Lump Sum	\$ _____	\$ _____
MCR		Minor Contract Revisions	---	---	---	\$ <u>65,000.00</u>
Bid Amount:					\$	_____

Bid Amount: _____ **dollars**

Contractor Name:
Contractor Address:
Contractor Phone #:

The undersigned Bidder proposes to subcontract the following portion of Work:

<u>Name & address of Sub-Contractor</u>	<u>Description of work to be performed</u>	<u>% of Contract</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

The undersigned Bidder acknowledges the right of the City to reject any and all Bids submitted and to waive informalities and irregularities therein in the City's sole discretion.

By submission of the Bid, each Bidder certifies, and in the case of a joint Bid each party thereto certifies as to his own organization, that this Bid has been arrived at independently, without collusion, consultation, communication, or agreement as to any matter relating to this Bid with any other Bidder or with any competitor.

Appendix A

Project Submittal Form

PROJECT SUBMITTAL FORM

PROJECT: **Persigo WWTP – Diffuser Outfall Improvements Project**

CONTRACTOR:

PROJECT ENGINEER: Lee Cooper

Description	Date Received	Resubmittal Requested	Resubmittal Received	Date Accepted
-------------	---------------	-----------------------	----------------------	---------------

DIFFUSER OUTFALL CONSTRUCTION

48 Inch RCP Pipe				
54 Inch HDPE Pipe				
60 Inch Steel Casing Pipe				
Manhole Structures				
Pipe Bedding Material				
Wide-bill Duckbill Diffuser Assembly by TideFlex				
Casing Spacers				
Casing Pipe End Caps				
Concrete Mix Design				
Steel Reinforcement				
Non-Shrink Grout				
Interstate 70 – Plan of Action (POA) (Per Specification 02612)				
Temporary Diversion (Coffer Dam)				
Bypass Pumping Plan (Effluent Flows)				
Riprap (D ₅₀ = 9")				
Soil Conditioning				
Mulching				
Seeding (Native)				
Soil Lift Fabric				
Construction Schedule				
Labor and Equipment hourly rate table				

APPENDIX B

Project Manual

CONSTRUCTION SPECIFICATIONS

PERSIGO WASH WASTEWATER TREATMENT PLANT DIFFUSER OUTFALL

GRAND JUNCTION, COLORADO

July, 2017



2000 S. Colorado Boulevard, Suite 2-300
Denver, CO 80222



(SEAL)

CONTRACT DOCUMENTS

**CONDITIONS OF THE
CONTRACT**

SOILS REPORT



Huddleston-Berry
Engineering & Testing, LLC

**GEOLOGIC HAZARDS AND GEOTECHNICAL
INVESTIGATION
PERSIGO WASTEWATER TREATMENT PLANT
OUTFALL
GRAND JUNCTION, COLORADO
PROJECT#01543-0001**

**STANTEC CONSULTING, LTD
2000 S. COLORADO BOULEVARD, SUITE 2-300
DENVER, COLORADO 80222**

MAY 9, 2016

**Huddleston-Berry Engineering and Testing, LLC
640 White Avenue, Unit B
Grand Junction, Colorado 81501**

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FIGURES

- Figure 1 – Site Location Map
- Figure 2 – Site Plan
- Figure 3 – Fence Diagram

APPENDICES

- Appendix A – USDA NRCS Soil Survey Data
- Appendix B – Typed Boring Logs

1.0 INTRODUCTION

As part of continued infrastructure improvements, the City of Grand Junction intends to construct a new outfall for the Persigo Wastewater Treatment Plant (WWTP). As part of the design development process, Huddlestone-Berry Engineering and Testing, LLC (HBET) was retained by Stantec to conduct a geologic hazards and geotechnical investigation at the site.

1.1 Scope

As discussed above, a geologic hazards and geotechnical investigation was conducted for the Persigo WWTP Outfall project in Grand Junction, Colorado. The scope of the investigation included the following components:

- Conducting a subsurface investigation to evaluate the subsurface conditions at the site.
- Providing recommendations for trenchless excavation, trench excavation, and general earthwork procedures.
- Evaluating potential geologic hazards at the site.

The investigation and report were completed by a Colorado registered professional engineer in accordance with generally accepted geotechnical and geological engineering practices. This report has been prepared for the exclusive use of Stantec and the City of Grand Junction.

1.2 Site Location and Description

The site is located south of the Persigo WWTP in Grand Junction, Colorado. The project location is shown on Figure 1 – Site Location Map.

The project area had a general slight downward slope to the south. However, Interstate 70 ran through the project area and the highway lanes sat on large earthen embankments. The Mesa County Riverfront Trail ran through the southern portion of the site.

1.3 Proposed Construction

The proposed construction is anticipated to include a new outfall from the Persigo WWTP to the Colorado River. As part of the construction, the new outfall pipe will be bored beneath I-70.

2.0 GEOLOGIC SETTING

2.1 Soils

Soils data was obtained from the USDA Natural Resource Conservation Service Web Soil Survey. The data indicates that the site is underlain by Sagers silty clay loam saline, 0 to 2 percent slopes, and Bebeever and Green River soils, and Riverwash, 0 to 2 percent slopes. Soil survey data is included in Appendix A.

Excavation in the site soils is described as being somewhat limited to very limited due to dust, unstable excavation walls, and/or depth to saturated zone. The site soils are indicated to have a low to moderate potential for frost action, moderate to high risk of corrosion of uncoated steel, and low to high risk of corrosion of concrete.

2.2 Geology

According to the *Geologic Map of Colorado* by Ogden Tweto (1979), the site is underlain by Quaternary alluvium. The alluvium is underlain by Mancos shale bedrock. The Mancos shale unit is thick in the Grand Valley and has a low to moderate potential for expansion.

2.3 Groundwater

Groundwater was encountered in most of the borings at depths of between 5.0 and 14.5 feet below the ground surface at the time of the investigation.

3.0 FIELD INVESTIGATION

3.1 Subsurface Investigation

The subsurface investigation was conducted on April 14th, 2016 and consisted of five geotechnical borings. The borings were drilled to depths of between 16.0 and 23.0 feet below the existing ground surface. Boring locations are shown on Figure 2 – Site Plan. Typed boring logs are included in Appendix B. Samples of the native soils were collected during Standard Penetration Testing (SPT) and using bulk sampling methods at the locations shown on the logs.

As shown on the logs, the subsurface conditions were variable. Boring B-1, conducted in the north shoulder of the westbound lanes of I-70, encountered asphalt pavement above sandy gravel fill to a depth of 10.0 feet. Below the fill, brown, moist to wet, medium dense silty sand with gravel extended to a depth of 15.0 feet. The sand was underlain by brown, wet, dense sandy gravel and cobbles to the bottom of the boring. Groundwater was encountered in B-1 at a depth of 10.5 feet at the time of the investigation.

Boring B-2, conducted in the I-70 median, encountered 5.0 feet of brown, moist, medium dense clayey sand with gravel above brown, moist to wet, dense sandy gravel and cobbles to a depth of 17.0 feet. The gravel and cobble soils were underlain by black, hard, highly weathered shale bedrock to the bottom of the boring. Groundwater was encountered in B-2 at a depth of 6.0 feet at the time of the investigation.

Boring B-3, conducted in the south shoulder of the eastbound lanes of I-70, encountered asphalt pavement above sandy gravel fill to a depth of 9.5 feet. Below the fill, brown, moist to wet, dense sandy gravel and cobbles extended to the bottom of the boring. Groundwater was encountered in B-3 at a depth of 14.5 feet at the time of the investigation.

Boring B-4, conducted south of the Mesa County Riverfront Trail, encountered brown, moist to wet, very loose silty sand from the ground surface to a depth of 12.0 feet. The sand was underlain by brown, wet, dense sandy gravel and cobbles to a depth of 17.0 feet. Below the gravel and cobble soils, black, hard, highly weathered shale bedrock extended to the bottom of the boring. Groundwater was encountered in B-4 at a depth of 5.0 feet at the time of the investigation.

Boring B-5, conducted near the southwest corner of the Persigo WWTP property, encountered brown, moist to wet, medium dense to dense sandy gravel and cobbles from the ground surface to the bottom of the boring. Groundwater was encountered in B-5 at a depth of 8.0 feet at the time of the investigation.

4.0 GEOLOGIC INTERPRETATION

4.1 Geologic Hazards

The only geologic hazard identified on the site is the presence of shallow groundwater.

4.2 Geologic Constraints

In general, the primary geologic constraint to construction at the site is the presence of shallow groundwater.

4.3 Water Resources

No water supply wells were observed in the project area. As discussed previously, shallow groundwater was encountered in the borings. In general, with proper design and construction, the proposed construction is not anticipated to adversely impact surface water or groundwater.

4.4 Mineral Resources

Potential mineral resources in western Colorado generally include gravel, uranium ore, and commercial rock products such as flagstone. As discussed previously, gravels were encountered in the subsurface at the site. However, HBET does not believe that the gravels at the site represent an economically recoverable resource.

5.0 CONCLUSIONS

Based upon the available data sources, field investigation, and nature of the proposed construction, HBET does not believe that there are any geologic conditions which should preclude construction at this site. However, shallow groundwater will likely impact the construction.

6.0 RECOMMENDATIONS

6.1 Trenchless Construction Feasibility

Figure 3 is a fence diagram generated from the geotechnical data based upon profiles provided by Stantec. Although the ground surface elevations of the borings are estimates from the Mesa County GIS database, the diagram suggests that the entire bore under I-70 will be conducted in granular materials below the water table. As a result, the suitable methods for trenchless construction are limited.

In general, based upon the soil conditions at the site, microtunneling is the preferred method of installing the water line. However, microtunneling can be expensive. Horizontal direction drilling can also be considered. However, bentonite slurry will be required due to the granular nature of the soils. In general, it is recommended that the actual method used be selected by a contractor with extensive experience with granular soils and shallow groundwater conditions.

6.2 Corrosion of Concrete

The USDA soil survey data indicates that the native soils have a low to high risk of corrosion of concrete. As a result, at a minimum, Type I-II sulfate resistant cement is recommended for this site.

6.3 Corrosion of Steel

As discussed previously, the USDA Soil Survey data indicate that the native soils are moderately to highly corrosive to uncoated steel. As a result, corrosion should be considered in design of any steel elements proposed to be used as part of the construction.

6.4 Lateral Earth Pressures

Any shoring or retaining walls should be designed to resist lateral earth pressures. For backfill consisting of the native soils or imported granular, non-free draining, non-expansive material, we recommend that the walls be designed for an equivalent fluid unit weight of 55 pcf in areas where no surcharge loads are present. Lateral earth pressures should be increased as necessary to reflect any surcharge loading behind the walls. Native shale materials should not be used as backfill.

6.5 Excavations

Excavations in the soils at the site may stand for short periods of time but should not be considered to be stable. In general, the site soils classify as Type C soil with regard to OSHA's Construction Standards for Excavations. For Type C soils, the maximum allowable slope in temporary cuts is 1.5H:1V. However, based upon the granular nature of the soils and shallow groundwater conditions, shoring may be required. In addition, dewatering may be required.

7.0 GENERAL

The recommendations included above are based upon the results of the subsurface investigation and on our local experience. These conclusions and recommendations are valid only for the proposed construction.

As discussed previously, the subsurface conditions at the site were variable. However, the precise nature and extent of any subsurface variability may not become evident until construction. Therefore, it is recommended that a representative of HBET observe excavations to verify that the subsurface conditions are consistent with those described herein.

Huddlestone-Berry Engineering and Testing, LLC is pleased to be of service to your project. Please contact us if you have any questions or comments regarding the contents of this report.

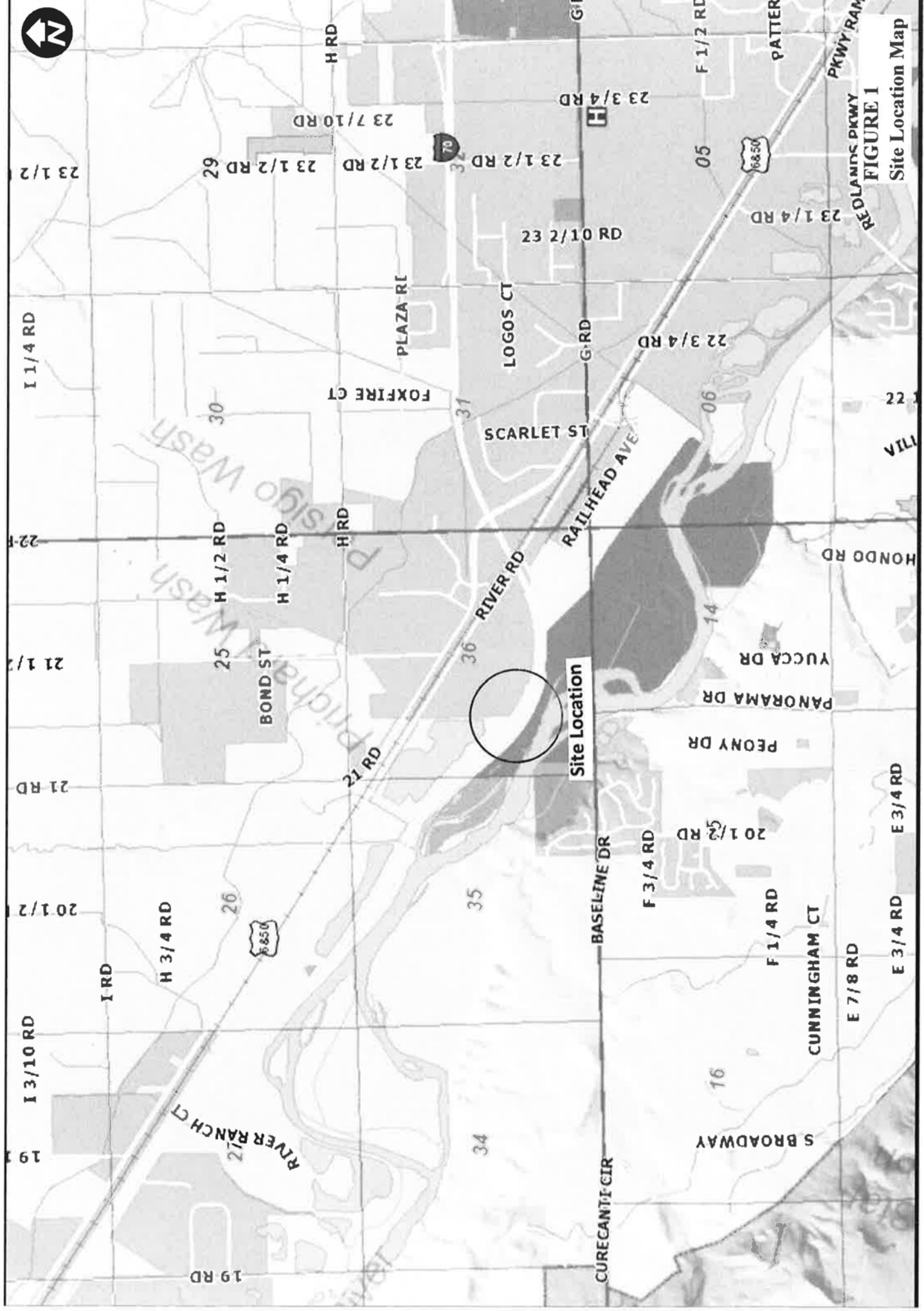
Respectfully Submitted:

Huddlestone-Berry Engineering and Testing, LLC



Michael A. Berry, P.E.
Vice President of Engineering

FIGURES



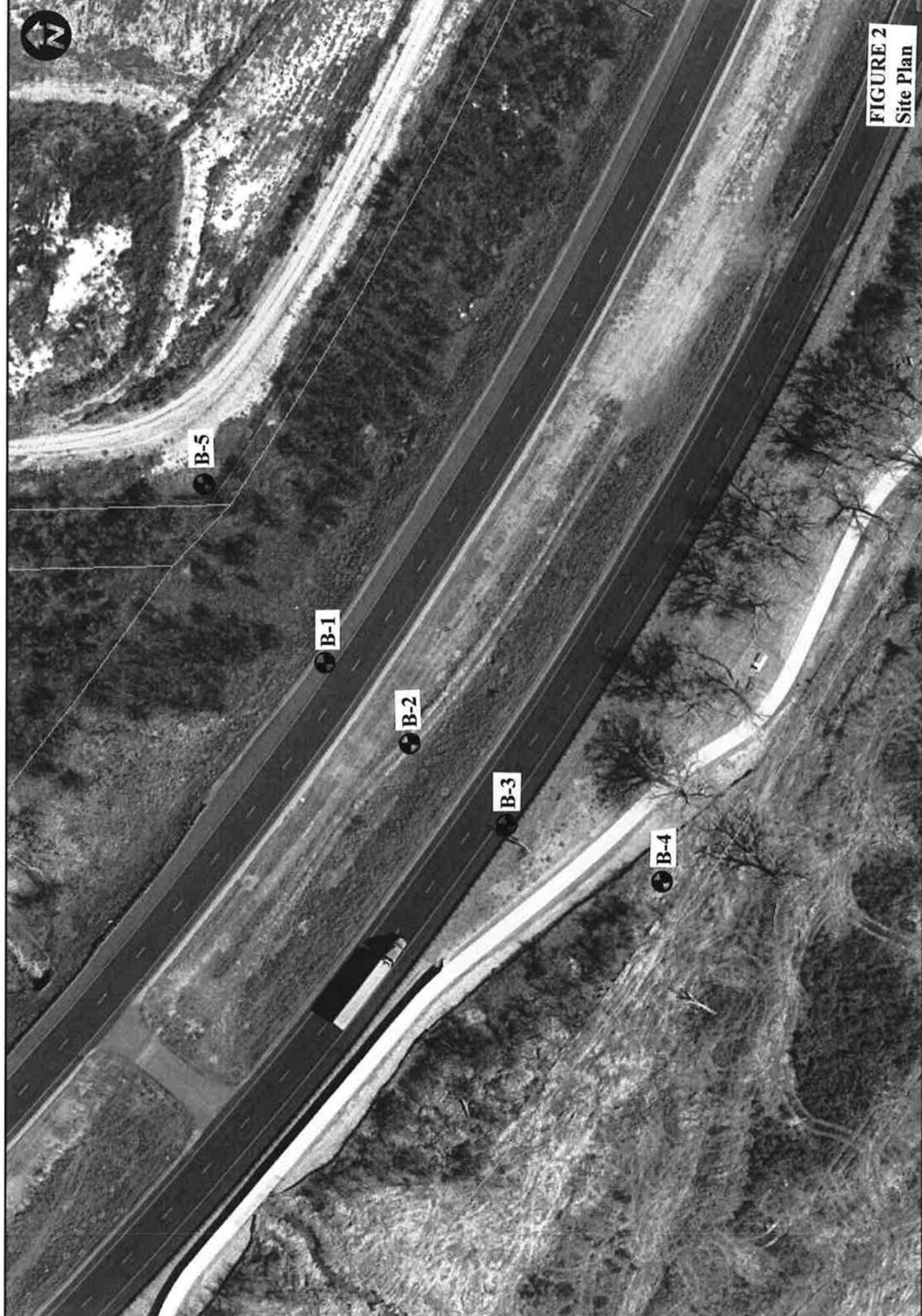


FIGURE 2
Site Plan

Mesa County Map

The Geographic Information System (GIS) and its components are designed as a source of reference for planning, analysis, and modeling. GIS is not intended or does not replace legal description information in the chain of title and other information contained in official government records such as the County Clerk and Records Office or the courts. In addition, the information contained herein is believed accurate and suitable for the intended uses and subject to the limitations set forth herein. Mesa County warrants no liability for any information contained herein. User's Manual



Huddlestone-Berry Engineering & Testing, LLC
640 White Avenue, Unit B
Grand Junction, CO 81501
970-255-8005
970-255-6818

SUBSURFACE DIAGRAM

CLIENT Stantec

PROJECT NAME Persigo Outfall

PROJECT NUMBER 01543-0001

PROJECT LOCATION Grand Junction, CO

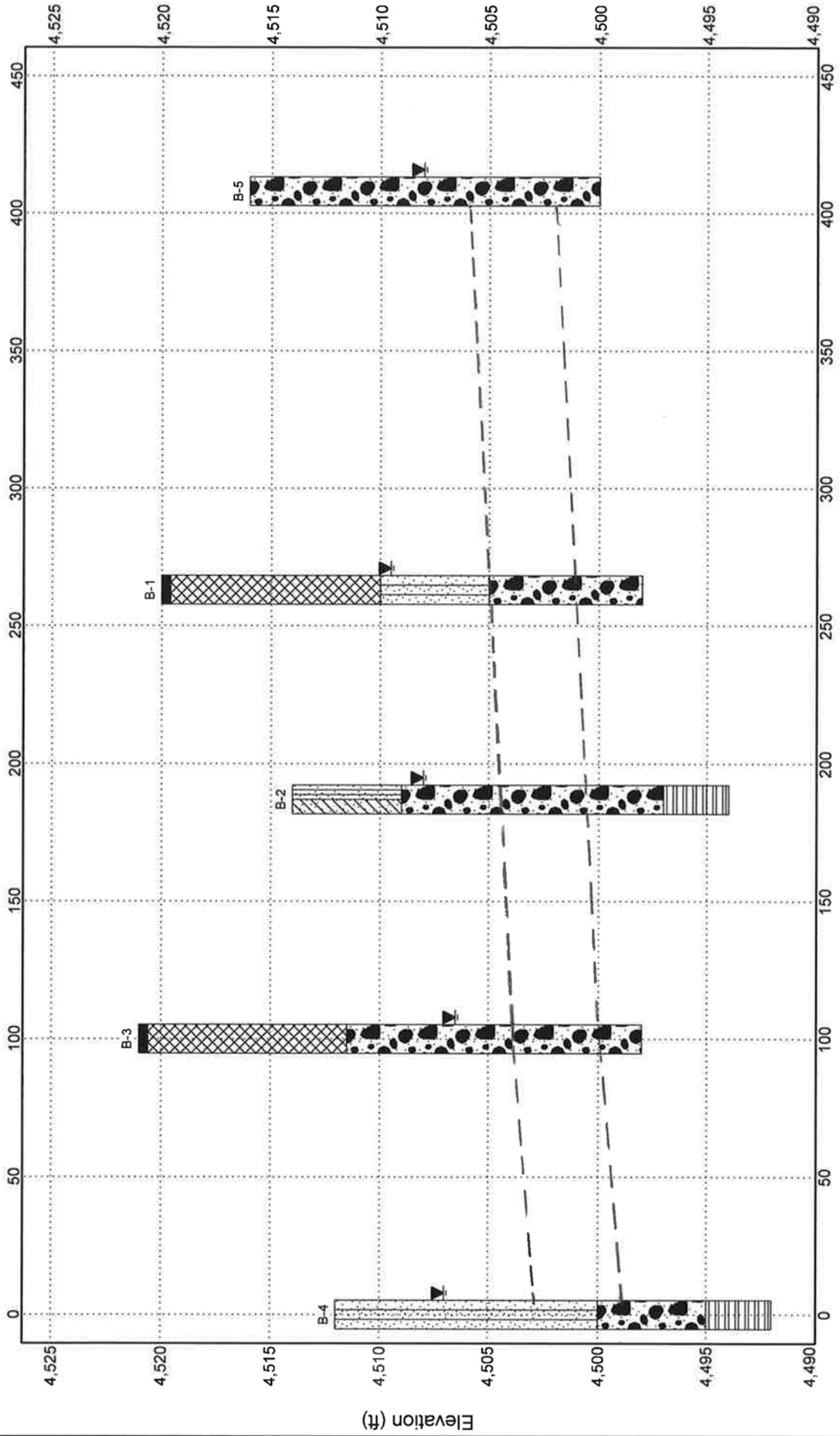


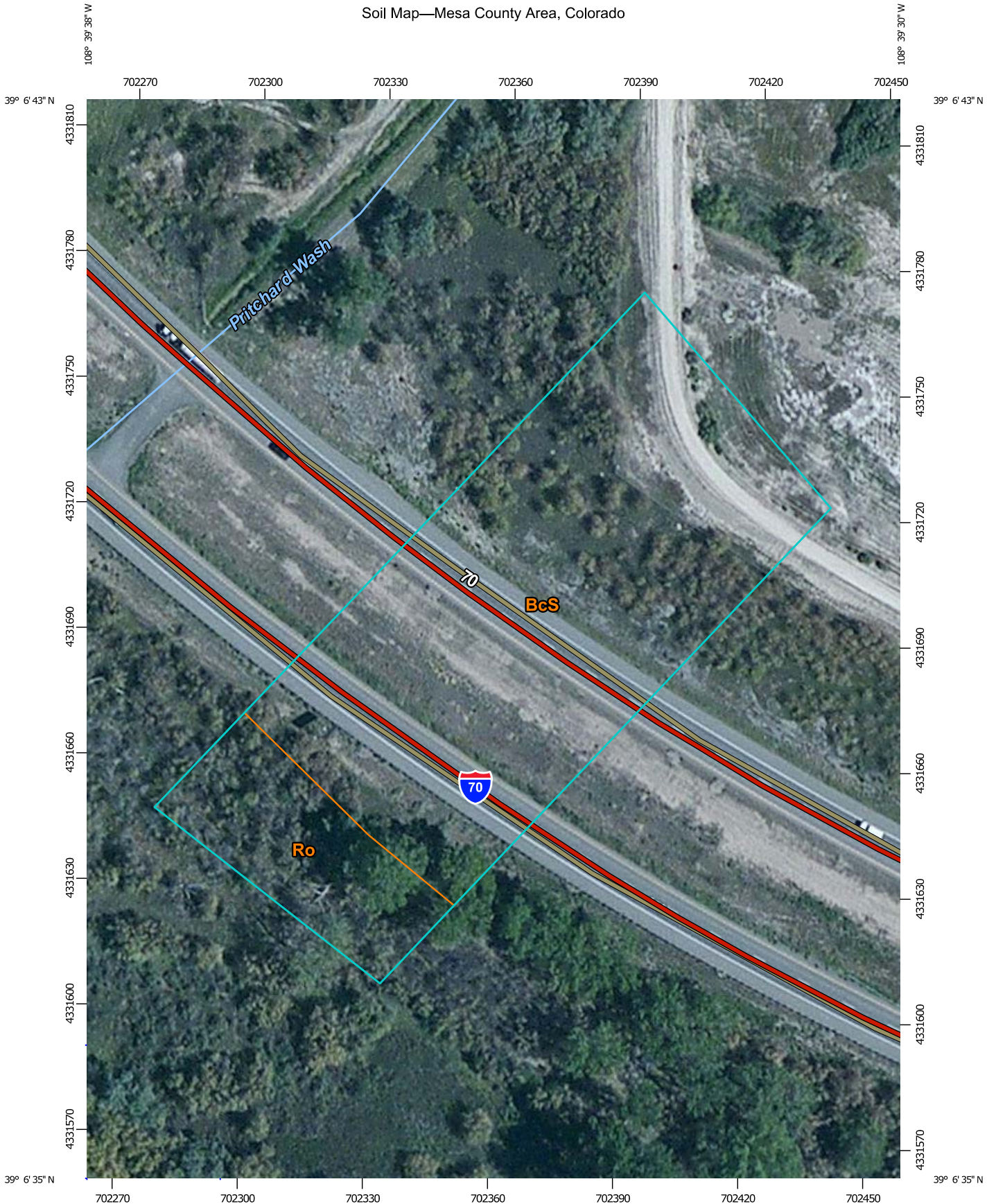
FIGURE 3
Fence Diagram

Distance Along Baseline (ft)

Elevation (ft)

APPENDIX A
Soil Survey Data

Soil Map—Mesa County Area, Colorado




































Map Scale: 1:1,260 if printed on A portrait (8.5" x 11") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84

MAP LEGEND

-  Area of Interest (AOI)
-  Soil Map Unit Polygons
-  Soil Map Unit Lines
-  Soil Map Unit Points
- Special Point Features**
-  Blowout
-  Borrow Pit
-  Clay Spot
-  Closed Depression
-  Gravel Pit
-  Gravelly Spot
-  Landfill
-  Lava Flow
-  Marsh or swamp
-  Mine or Quarry
-  Miscellaneous Water
-  Perennial Water
-  Rock Outcrop
-  Saline Spot
-  Sandy Spot
-  Severely Eroded Spot
-  Sinkhole
-  Slide or Slip
-  Sodic Spot
-  Spoil Area
-  Stony Spot
-  Very Stony Spot
-  Wet Spot
-  Other
-  Special Line Features
- Water Features**
-  Streams and Canals
- Transportation**
-  Rails
-  Interstate Highways
-  US Routes
-  Major Roads
-  Local Roads
- Background**
-  Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
 Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>
 Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Mesa County Area, Colorado
 Survey Area Data: Version 6, Sep 23, 2015

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 22, 2010—Sep 2, 2010

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Mesa County Area, Colorado (CO680)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BcS	Sagers silty clay loam, saline, 0 to 2 percent slopes	2.3	83.0%
Ro	Bebeevar and Green River soils, and Riverwash, 0 to 2 percent slopes	0.5	17.0%
Totals for Area of Interest		2.8	100.0%

Map Unit Description

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this report, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. All the soils of a series have major horizons that are similar in composition, thickness, and arrangement. Soils of a given series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Additional information about the map units described in this report is available in other soil reports, which give properties of the soils and the limitations, capabilities, and potentials for many uses. Also, the narratives that accompany the soil reports define some of the properties included in the map unit descriptions.

Report—Map Unit Description

Mesa County Area, Colorado

BcS—Sagers silty clay loam, saline, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: k0bs

Elevation: 4,500 to 4,900 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 50 to 54 degrees F

Frost-free period: 150 to 190 days

Farmland classification: Not prime farmland

Map Unit Composition

Sagers, saline, and similar soils: 90 percent

Minor components: 10 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sagers, Saline

Setting

Landform: Alluvial fans, terraces

Landform position (three-dimensional): Tread

Down-slope shape: Concave

Across-slope shape: Linear

Parent material: Alluvium derived from calcareous shale and sandstone

Typical profile

Ap - 0 to 12 inches: silty clay loam

C - 12 to 25 inches: silty clay loam

Cy - 25 to 60 inches: silty clay loam

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Well drained

Runoff class: Low

Capacity of the most limiting layer to transmit water (Ksat):

Moderately high (0.20 to 0.60 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum in profile: 15 percent

Gypsum, maximum in profile: 5 percent

Salinity, maximum in profile: Strongly saline (16.0 to 32.0 mmhos/cm)

Available water storage in profile: Very low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 8s

Hydrologic Soil Group: C

Minor Components

Massadona

Percent of map unit: 10 percent

Landform: Alluvial fans

Down-slope shape: Concave

Across-slope shape: Linear

Ro—Bebeever and Green River soils, and Riverwash, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: k0d4
Elevation: 4,430 to 4,820 feet
Mean annual precipitation: 7 to 10 inches
Mean annual air temperature: 50 to 54 degrees F
Frost-free period: 135 to 190 days
Farmland classification: Not prime farmland

Map Unit Composition

Bebeever and similar soils: 45 percent
Green river and similar soils: 35 percent
Riverwash: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bebeever

Setting

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium over sandy and gravelly alluvium derived from sandstone and shale

Typical profile

Ap - 0 to 9 inches: loam
C1 - 9 to 14 inches: loam
C2 - 14 to 18 inches: fine sandy loam
2C - 18 to 32 inches: sand
3C - 32 to 59 inches: very cobbly sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat):
Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 24 to 48 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): 3s
Land capability classification (nonirrigated): 7s

Hydrologic Soil Group: C

Description of Green River

Setting

Landform: Flood plains, terraces

Landform position (three-dimensional): Tread

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Clayey alluvium over coarse-loamy alluvium derived from sandstone and shale

Typical profile

Ap - 0 to 10 inches: silty clay loam

C1 - 10 to 16 inches: fine sandy loam

C2 - 16 to 24 inches: fine sandy loam

C3 - 24 to 32 inches: fine sandy loam

C4 - 32 to 44 inches: fine sandy loam

C5 - 44 to 52 inches: fine sandy loam

2C - 52 to 60 inches: very cobbly sand

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Moderately well drained

Runoff class: Low

Capacity of the most limiting layer to transmit water (Ksat):

Moderately high (0.20 to 0.60 in/hr)

Depth to water table: About 24 to 48 inches

Frequency of flooding: Rare

Frequency of ponding: None

Calcium carbonate, maximum in profile: 5 percent

Salinity, maximum in profile: Very slightly saline to strongly saline (2.0 to 16.0 mmhos/cm)

Sodium adsorption ratio, maximum in profile: 5.0

Available water storage in profile: Moderate (about 7.7 inches)

Interpretive groups

Land capability classification (irrigated): 2e

Land capability classification (nonirrigated): 7c

Hydrologic Soil Group: C

Description of Riverwash

Setting

Landform: Flood plains

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Sandy and gravelly alluvium

Typical profile

C1 - 0 to 6 inches: very gravelly sand

C2 - 6 to 60 inches: stratified extremely gravelly coarse sand to gravelly sand

Properties and qualities

Slope: 0 to 2 percent

Natural drainage class: Somewhat excessively drained

Runoff class: Low

Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)

Depth to water table: About 0 to 24 inches

Frequency of flooding: Frequent

Available water storage in profile: Very low (about 1.8 inches)

Interpretive groups

Land capability classification (irrigated): 6w

Land capability classification (nonirrigated): 7w

Hydrologic Soil Group: A

Data Source Information

Soil Survey Area: Mesa County Area, Colorado

Survey Area Data: Version 6, Sep 23, 2015

Roads and Streets, Shallow Excavations, and Lawns and Landscaping

Soil properties influence the development of building sites, including the selection of the site, the design of the structure, construction, performance after construction, and maintenance. This table shows the degree and kind of soil limitations that affect local roads and streets, shallow excavations, and lawns and landscaping.

The ratings in the table are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect building site development. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the table indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or soil material stabilized by lime or cement; and a surface of flexible material (asphalt), rigid material (concrete), or gravel with a binder. The ratings are based on the soil properties that affect the ease of excavation and grading and the traffic-supporting capacity. The properties that affect the ease of excavation and grading are depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, depth to a water table, ponding, flooding, the amount of large stones, and slope. The properties that affect the traffic-supporting capacity are soil strength (as inferred from the AASHTO group index number), subsidence, linear extensibility (shrink-swell potential), the potential for frost action, depth to a water table, and ponding.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for graves, utility lines, open ditches, or other purposes. The ratings are based on the soil properties that influence the ease of digging and the resistance to sloughing. Depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, the amount of large stones, and dense layers influence the ease of digging, filling, and compacting. Depth to the seasonal high water table, flooding, and ponding may restrict the period when excavations can be made. Slope influences the ease of using machinery. Soil texture, depth to the water table, and linear extensibility (shrink-swell potential) influence the resistance to sloughing.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. Irrigation is not considered in the ratings. The ratings are based on the soil properties that affect plant growth and trafficability after vegetation is established. The properties that affect plant growth are reaction; depth to a water table; ponding; depth to bedrock or a cemented pan; the available water capacity in the upper 40 inches; the content of salts, sodium, or calcium carbonate; and sulfidic materials. The properties that affect trafficability are flooding, depth to a water table, ponding, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer.

Information in this table is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil between the surface and a depth of 5 to 7 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this table. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Report—Roads and Streets, Shallow Excavations, and Lawns and Landscaping

[Onsite investigation may be needed to validate the interpretations in this table and to confirm the identity of the soil on a given site. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the potential limitation. The table shows only the top five limitations for any given soil. The soil may have additional limitations]

Roads and Streets, Shallow Excavations, and Lawns and Landscaping—Mesa County Area, Colorado							
Map symbol and soil name	Pct. of map unit	Local roads and streets		Shallow excavations		Lawns and landscaping	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
BcS—Sagers silty clay loam, saline, 0 to 2 percent slopes							
Sagers, saline	90	Very limited		Somewhat limited		Very limited	
		Low strength	1.00	Dusty	0.50	Salinity	1.00
		Shrink-swell	0.50	Unstable excavation walls	0.01	Droughty	0.98
						Dusty	0.50

Roads and Streets, Shallow Excavations, and Lawns and Landscaping—Mesa County Area, Colorado							
Map symbol and soil name	Pct. of map unit	Local roads and streets		Shallow excavations		Lawns and landscaping	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
Ro—Bebeever and Green River soils, and Riverwash, 0 to 2 percent slopes							
Bebeever	45	Somewhat limited		Very limited		Somewhat limited	
		Flooding	0.40	Unstable excavation walls	1.00	Dusty	0.19
				Depth to saturated zone	0.96		
				Dusty	0.19		
Green river	35	Somewhat limited		Somewhat limited		Somewhat limited	
		Flooding	0.40	Depth to saturated zone	0.96	Dusty	0.29
				Dusty	0.29	Salinity	0.13
				Unstable excavation walls	0.01		
Riverwash	20	Not rated		Not rated		Not rated	

Data Source Information

Soil Survey Area: Mesa County Area, Colorado
 Survey Area Data: Version 6, Sep 23, 2015

Soil Features

This table gives estimates of various soil features. The estimates are used in land use planning that involves engineering considerations.

A *restrictive layer* is a nearly continuous layer that has one or more physical, chemical, or thermal properties that significantly impede the movement of water and air through the soil or that restrict roots or otherwise provide an unfavorable root environment. Examples are bedrock, cemented layers, dense layers, and frozen layers. The table indicates the hardness and thickness of the restrictive layer, both of which significantly affect the ease of excavation. *Depth to top* is the vertical distance from the soil surface to the upper boundary of the restrictive layer.

Subsidence is the settlement of organic soils or of saturated mineral soils of very low density. Subsidence generally results from either desiccation and shrinkage, or oxidation of organic material, or both, following drainage. Subsidence takes place gradually, usually over a period of several years. The table shows the expected initial subsidence, which usually is a result of drainage, and total subsidence, which results from a combination of factors.

Potential for frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, saturated hydraulic conductivity (Ksat), content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel or concrete in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the steel or concrete in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion also is expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Report—Soil Features

Soil Features—Mesa County Area, Colorado										
Map symbol and soil name	Restrictive Layer			Hardness	Subsidence		Potential for frost action	Risk of corrosion		
	Kind	Depth to top	Thickness		Initial	Total		Uncoated steel	Concrete	
		Low-RV-High	Range		Low-High	High				
	In	In	In		In					
BcS—Sagers silty clay loam, saline, 0 to 2 percent slopes										
Sagers, saline	—	—	—		0	—	Low	High	High	
Ro—Bebevar and Green River soils, and Riverwash, 0 to 2 percent slopes										
Bebevar	—	—	—		0	—	Low	Moderate	Low	
Green river	—	—	—		0	—	Low	High	Moderate	
Riverwash	—	—	—		0	—	Low	High	Low	

Data Source Information

Soil Survey Area: Mesa County Area, Colorado
 Survey Area Data: Version 6, Sep 23, 2015



APPENDIX B
Typed Boring Logs



Huddlestone-Berry Engineering & Testing, LLC
 640 White Avenue, Unit B
 Grand Junction, CO 81501
 970-255-8005
 970-255-6818

BORING NUMBER B-1

PAGE 1 OF 1

CLIENT <u>Stantec</u>	PROJECT NAME <u>Persigo Outfall</u>
PROJECT NUMBER <u>01543-0001</u>	PROJECT LOCATION <u>Grand Junction, CO</u>
DATE STARTED <u>4/14/16</u> COMPLETED <u>4/20/16</u>	GROUND ELEVATION <u>4520 ft</u> HOLE SIZE _____
DRILLING CONTRACTOR <u>S. McKracken</u>	GROUND WATER LEVELS:
DRILLING METHOD <u>Simco 2000 Truck Rig</u>	▽ AT TIME OF DRILLING <u>10.5 ft / Elev 4509.5 ft</u>
LOGGED BY <u>CM</u> CHECKED BY <u>MAB</u>	▼ AT END OF DRILLING <u>10.5 ft / Elev 4509.5 ft</u>
NOTES _____	AFTER DRILLING <u>---</u>

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		ASPHALT										
		Sandy GRAVEL (FILL), brown, moist dense	SS 1	0	50							
5												
		Silty SAND with Gravel (sm), brown, moist to wet, medium dense	SS 2	56	20-20-17 (37)							
10												
		Sandy GRAVEL and COBBLES (gw), brown, wet, dense	SS 3	56	7-8-7 (15)							
15												
20												
		Bottom of hole at 22.0 feet.										

GEOTECH BH COLUMNS 01543-0001.GPJ GINT US LAB GDT 5/9/16



Huddlestone-Berry Engineering & Testing, LLC
 640 White Avenue, Unit B
 Grand Junction, CO 81501
 970-255-8005
 970-255-6818

BORING NUMBER B-2

PAGE 1 OF 1

CLIENT Stantec PROJECT NAME Persigo Outfall
 PROJECT NUMBER 01543-0001 PROJECT LOCATION Grand Junction, CO
 DATE STARTED 4/14/16 COMPLETED 4/20/16 GROUND ELEVATION 4514 ft HOLE SIZE _____
 DRILLING CONTRACTOR S. McCracken GROUND WATER LEVELS:
 DRILLING METHOD Simco 2000 Truck Rig ▽ AT TIME OF DRILLING 6.0 ft / Elev 4508.0 ft
 LOGGED BY CM CHECKED BY MAB ▽ AT END OF DRILLING 6.0 ft / Elev 4508.0 ft
 NOTES _____ AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		Clayey SAND with Gravel (sc-sm), brown, moist, medium dense										
5		Sandy GRAVEL and COBBLES (gw), brown, moist to wet, dense	SS 1		14-22							
10												
15		SHALE, black, hard, highly weathered										
20		Bottom of hole at 20.0 feet.										

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 640 White Avenue, Unit B
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 970-255-8005
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BORING NUMBER B-3

PAGE 1 OF 1

CLIENT Stantec PROJECT NAME Persigo Outfall
 PROJECT NUMBER 01543-0001 PROJECT LOCATION Grand Junction, CO
 DATE STARTED 4/14/16 COMPLETED 4/20/16 GROUND ELEVATION 4521 ft HOLE SIZE _____
 DRILLING CONTRACTOR S. McCracken GROUND WATER LEVELS:
 DRILLING METHOD Simco 2000 Track Rig ▽ AT TIME OF DRILLING 14.5 ft / Elev 4506.5 ft
 LOGGED BY CM CHECKED BY MAB ▽ AT END OF DRILLING 14.5 ft / Elev 4506.5 ft
 NOTES _____ AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (ROD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		ASPHALT										
		Sandy GRAVEL (FILL), brown, moist dense										
5			SS 1	67	17-17-26 (43)							
10		Sandy GRAVEL and COBBLES (gw), brown, moist to wet, dense										
			SS 2	75	20-25							
15			SS 3	61	15-18-21 (39)							
20												
		Bottom of hole at 23.0 feet.										

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 970-255-6818

BORING NUMBER B-5

CLIENT Stantec PROJECT NAME Persigo Outfall
 PROJECT NUMBER 01543-0001 PROJECT LOCATION Grand Junction, CO
 DATE STARTED 4/14/16 COMPLETED 4/14/16 GROUND ELEVATION 4516 ft HOLE SIZE _____
 DRILLING CONTRACTOR S. McCracken GROUND WATER LEVELS:
 DRILLING METHOD Simco 2000 Truck Rig ▽ AT TIME OF DRILLING 8.0 ft / Elev 4508.0 ft
 LOGGED BY CM CHECKED BY MAB ▽ AT END OF DRILLING 8.0 ft / Elev 4508.0 ft
 NOTES _____ AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		Sandy GRAVEL and COBBLES (gw), brown, moist to wet, medium dense to dense	SS 1	11	10-12-10 (22)							
5												
10												
15												
		Bottom of hole at 16.0 feet.										

GEOTECH BH COLUMNS 01543-0001.GPJ GINT US LAB.GDT 5/9/16

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REFERENCED SPECIFICATIONS

107.25 Water Quality Control. The project work shall be performed using practices that minimize water pollution during construction. All the practices listed in (b) below shall be followed to minimize the pollution of any state waters, including wetlands.

(a) *Definitions.*

1. *Pollutant.* Dredged spoil, dirt, slurry, solid waste, incinerator residue, sewage, sewage sludge, garbage, trash, chemical waste, biological nutrient, biological material, radioactive material, heat, wrecked or discarded equipment, rock, sand, or any industrial, municipal, or agricultural waste. [25-8-103 (15), CRS]
2. *Pollution.* Man-made, man-induced, or natural alteration of the physical, chemical, biological, and radiological integrity of water. [25-8-103 (16), CRS]
3. *State Waters.* State Waters means any and all surface and subsurface waters which are contained in or flow in or through this state, but does not include waters in sewage systems, waters in treatment works of disposal systems, waters in potable water distribution systems, and all water withdrawn for use until use and treatment have been completed.

(b) *Construction Requirements.*

1. The Contractor shall comply with the “Colorado Water Quality Control Act” (Title 25, Article 8, CRS), the “Protection of Fishing Streams” (Title 33, Article 5, CRS), the “Clean Water Act” (33 USC 1344), regulations promulgated, certifications or permits issued, and to the requirements listed below. In the event of conflicts between these requirements and water quality control laws, rules, or regulations of other Federal, or State agencies, the more restrictive laws, rules, or regulations shall apply.

2. If the Contractor determines construction of the project will result in a change to the permitted activities, the Contractor shall detail the changes in a written report to the Engineer. Within five days after receipt of the report, the Engineer, after coordination with Region Environmental, will approve or reject in writing the request for change, or detail a course of action including revision of existing permits or obtaining new permits.
3. If construction activities result in noncompliance of any permitted activity, the project will be suspended and the permitting agency notified. The project will remain suspended until the Engineer receives written approval by the permitting agency.
4. The Contractor may be legally required to obtain permits associated with specific activities within, or off the Right of Way, such as borrow pits, concrete or asphalt plant sites, waste disposal sites, or other facilities. It is the Contractor's responsibility to obtain these permits. The Contractor shall consult with the Engineer, and contact the Colorado Department of Public Health and Environment (CDPHE) or other appropriate federal, state, or local agency to determine the need for any permit.
5. The Contractor shall conduct the work in a manner that minimizes pollution of any adjacent waters, including wetlands. Erosion control work shall be performed in accordance with Section 208, this subsection, and all other applicable parts of the Contract.
6. Prior to the environmental preconstruction conference the Erosion Control Supervisor (ECS), identified in subsection 208.03(c), shall identify and describe all potential pollutant sources, including materials and activities, and evaluate them for the potential to contribute pollutants to stormwater discharges associated with construction activities. The list of potential pollutants shall be continuously updated during construction. Each of the following shall be evaluated for the potential for contributing pollutants to stormwater discharges and identified in the SWMP, if found to have such potential:
 - (1) All exposed and stored soils
 - (2) Vehicle tracking of sediments
 - (3) Management of contaminated soils
 - (4) Vehicle and equipment maintenance and fueling
 - (5) Outdoor storage activities (building materials, fertilizers, chemicals, etc.)
 - (6) Significant dust or particle generating processes
 - (7) Routine maintenance involving fertilizers, pesticides, detergents, fuels, solvents, oils, etc.
 - (8) On site waste management practices (waste piles, dumpsters, etc.)

- (9) Dedicated asphalt and concrete batch plants
- (10) Concrete truck and equipment washing, including the concrete truck chute and associated fixtures and equipment
- (11) Concrete placement and finishing tool cleaning
- (12) Non-industrial waste sources that may be significant, such as worker trash and portable toilets
- (13) Loading and unloading operations
- (14) Other areas or procedures where spills could occur

The ECS shall record the location of potential pollutants on the site map. Descriptions of the potential pollutants shall be added to the SWMP notebook.

At or prior to the environmental preconstruction conference the Contractor shall submit a Spill Prevention, Control, and Countermeasure Plan (SPCC) for any petroleum products, chemicals, solvents, or other hazardous materials in use, or in storage, at the work site. See subsection 208.06(c) for SPCC plan requirements. Work shall not be started until the plan has been submitted to and approved by the Engineer.

- 7. The Contractor shall obtain a Construction Dewatering (CDW) permit from CDPHE anytime groundwater, including groundwater that is commingled with stormwater or surface water, is encountered during construction activities and the groundwater or commingled water needs to be discharged to surface water.
- 8. Water from dewatering operations shall not be directly discharged into any state waters, unless allowed by a permit. Water from dewatering shall not be discharged into a ditch unless:
 - (1) Written permission is obtained from the owner of the ditch.
 - (2) It is covered in the approved CDW permit that allows the discharge.
 - (3) A copy of this approval is submitted to the Engineer.

A copy of the CDW Permit shall be submitted to the Engineer prior to dewatering operations commencing.

If the site is covered by a Colorado Discharge Permit System Stormwater Construction Permit (CDPS-SCP) and the following conditions are met, a separate CDW permit will not be required for discharge to the ground.

- (1) The source is identified in the Stormwater Management Plan (SWMP) as updated by the ECS.
- (2) The SWMP describes and locates the practices implemented at the site to control stormwater pollution from the dewatering of groundwater or stormwater.

- (3) The SWMP describes and locates the practices to be used that will ensure that no groundwater from construction dewatering is discharged from the project boundary as surface runoff or to surface waters or storm sewers.
- (4) Groundwater and groundwater combined with stormwater does not contain pollutants in concentrations exceeding the State groundwater standards in Regulations 5 CCR 1002-41 and 42.

If surface water or seeps are diverted around a construction area and no pollutants are introduced during the diversion, a CDW Permit is not required. If the diverted water enters the construction area and contacts pollutant sources (e.g. disturbed soil, concrete washout, etc.), the Contractor shall obtain a CDW permit for the discharge of this water to surface water or to the ground.

Construction Dewatering may be discharged to the ground on projects that are not covered by a CDPS-SCP if the conditions of the CDPHE's low risk guidance document for Discharges of Uncontaminated Groundwater to Land are met. The conditions of this guidance are:

- (1) The source of the discharge is solely uncontaminated groundwater or uncontaminated groundwater combined with stormwater and does not contain pollutants in concentrations that exceed water quality standards for groundwater referenced above.
- (2) Discharges from vaults or similar structures shall not be contaminated. Potential sources of contamination include process materials used, stored, or conveyed in the structures, or introduced surface water runoff from outside environments that may contain oil, grease, and corrosives.
- (3) The groundwater discharge does not leave the project boundary limits where construction is occurring.
- (4) Land application is conducted at a rate and location that does not allow for any runoff into state waters or other drainage conveyance systems, including but not limited to streets, curb and gutter, inlets, borrow ditches, open channels, etc.
- (5) Land application is conducted at a rate that does not allow for any ponding of the groundwater on the surface, unless the ponding is a result of implementing BMPs that are designed to reduce velocity flow. If the BMPs used result in ponding, the land application shall be done in an area with a constructed containment, such as an excavation or berm area with no outfall. The constructed containment shall prevent the discharge of the ponding water offsite as runoff.
- (6) A visible sheen is not evident in the discharge.

- (7) BMPs are implemented to prevent any sediment deposited during land application from being transported by stormwater runoff to surface waters or other conveyances.

All BMPs used shall be selected, installed, implemented, and maintained according to good engineering, hydrologic and pollution control practices. The selected BMPs shall provide control for all potential pollutant sources associated with the discharge of uncontaminated groundwater to land.

The discharge shall be routed in such a way that it will not cause erosion to land surface. Energy dissipation devices designed to protect downstream areas from erosion by reducing the velocity of flow (such as hose attachments, sediment and erosion controls) shall be used when necessary to prevent erosion.

Discharged water shall be drained slowly so that it soaks into the ground without running outside the project boundary or causing flooding issues.

The discharge shall be routed in such a way that it will not contact petroleum products or waste.

9. At least 15 days prior to commencing dredging or fill operations in a watercourse, the Contractor shall provide written notification to owners or operators of domestic or public water supply intakes or diversion facilities, if these facilities are within 20 miles downstream from the dredging or fill operations. Notification shall also be given to Owners or operators of other intakes or diversions that are located within five miles downstream from the site of the project. Identities of downstream owners and operators can be obtained from Colorado Division of Water Resources, Office of the State Engineer.
10. Temporary fill into wetlands or streams will not be allowed, except as specified in the Contract and permits. If such work is allowed, upon completion of the work all temporary fills shall be removed in their entirety and disposed of in an upland location outside of flood plains unless otherwise specified in the Contract.
11. Construction operations in waters of the United States as defined in 33 CFR Part 328.3, including wetlands, shall be restricted to areas and activities authorized by the U.S. Army Corps of Engineers as shown in the Contract. Foraging waters will be allowed only as authorized by the U.S. Army Corps of Engineers 404 Permit.
12. Wetland areas outside of the permitted limits of disturbance shall not be used for storage, parking, waste disposal, access, borrow material, or any other construction support activity.
13. Pollutant by-products of highway construction, such as concrete, asphalt, solids, sludges, pollutants removed in the course of treatment

of wastewater, excavation or excess fill material, and material from sediment traps shall be handled, stockpiled, and disposed of in a manner that prevents entry into state waters, including wetlands.

Removal of concrete waste and washout water from mixer trucks, concrete finishing tools, concrete saw and all concrete material removed in the course of construction operations or cleaning shall be performed in a manner that prevents waste material from entering state waters. A minimum of ten days prior to the start of the construction activity, the Contractor shall submit in writing a method for containing pollutant byproducts to the Engineer for approval.

14. The use of chemicals such as soil stabilizers, dust palliatives, herbicides, growth inhibitors, fertilizers, deicing salts, etc., shall be in accordance with the manufacturer's recommended application rates, frequency, and instructions. These chemicals shall not be used, stored, or stockpiled within 50 horizontal feet of any state waters except when otherwise specified in the Contract.
15. Salvable material, excess excavated material, and fill material shall not be stored or stockpiled within 50 horizontal feet of any state waters except when constrained by the ROW or when the work takes place within roadside ditches. In both cases the excavated material shall be protected by BMPs approved by the Engineer.
16. Construction equipment, fuels, lubricants, and other petroleum distillates shall not be stored or stockpiled within 50 horizontal feet of any state waters. Equipment fueling and servicing shall occur only within approved designated areas.
17. All materials stored on-site shall be stored in a neat, orderly manner, in their original containers, with the original manufacturer's label. Materials shall not be stored in a location where they may be carried into a state water at any time.
18. Spill prevention and containment measures conforming to subsection 208.06 shall be used at storage, and equipment fueling and servicing areas to prevent the pollution of any state waters, including wetlands. All spills shall be cleaned up immediately after discovery, or contained until appropriate cleanup methods can be employed.

Manufacturer's recommended methods for spill cleanup shall be followed, along with proper disposal methods.

19. The Contractor shall prevent construction activities from causing grass or brush fires.
20. The construction activities shall not impair Indian tribal rights, including, but not limited to, water rights, and treaty fishing and hunting rights.

21. The Contractor shall certify in writing to the Engineer that construction equipment has been cleaned prior to initial site arrival. Vehicles shall be free of soil and debris.
22. During construction vehicle cleaning shall not occur on site unless in an approved area where wash water can be properly contained.
23. At the end of each day the Contractor shall collect all trash and dispose of it in appropriate containers.
24. Construction waste that is considered a pollutant or contaminant shall be collected and disposed of in appropriate containers. This material may be stockpiled on the project when it is contained or protected by an appropriate BMP.

(c) *Measurement and Payment.*

1. All the work listed in (b) above, including but not limited to dewatering, erosion control for dewatering, and disposal of water resulting from dewatering operations, including all costs for CDPHE concurrences and permits, will not be measured and paid for separately, but shall be included in the work.
2. The Contractor shall be liable for any penalty (including monetary fines) applied to the Department caused by the Contractor's noncompliance with any water quality permit or certification. Monetary fines shall be deducted from any money due to the Contractor. If the monetary fine is in excess of all the money due to the Contractor, then the Contractor shall pay to the Department the amount of such excess.
3. The Contractor will not receive additional compensation, or time extensions, for any disruption of work or loss of time caused by any actions brought against the Contractor for failure to comply with water quality controls.
4. If a spill occurs as a direct result of the Contractor's actions or negligence, the clean-up of such spill shall be performed by the Contractor at the Contractor's expense.
5. Areas exposed to erosion by fire resulting from the Contractor's operations shall be stabilized in accordance with Section 208 by the Contractor and at the Contractor's expense.

CONSTRUCTION DETAILS
DIVISION 200
EARTHWORK

SECTION 201
CLEARING AND GRUBBING

DESCRIPTION

201.01 This work consists of clearing, grubbing, removing, and disposing of vegetation and debris within the limits of the right of way, easement areas, borrow pits, and other areas shown in the Contract or required by the work. Vegetation and objects designated to remain shall be preserved free from injury or defacement.

CONSTRUCTION REQUIREMENTS

201.02 The Engineer will designate all trees, shrubs, plants, and other objects to remain. Every object that is designated to remain and is damaged shall be repaired or replaced as directed, at the Contractor's expense.

Clearing and grubbing shall extend to the toe of fill or the top of cut slopes, unless otherwise designated.

All surface objects, trees, stumps, roots, and other protruding obstructions not designated to remain shall be cleared and grubbed, including mowing, as required. Undisturbed stumps, roots, and nonperishable solid objects located 2 feet or more below subgrade or embankment slope may remain in place. In areas to be rounded at the tops of backslopes, stumps shall be removed to at least 2 feet below the surface of the final slope line.

Except in areas to be excavated, all holes resulting from the removal of obstructions shall be backfilled with suitable material and compacted in accordance with subsection 203.06.

Burning of perishable material will not be permitted without the written approval of the Engineer. If permitted, perishable material shall be burned under the constant care of the Contractor, at times and in a manner that will not endanger the surrounding vegetation, adjacent property, or objects designated to remain. Burning shall be done in accordance with applicable laws and ordinances.

No material or debris shall be disposed of within the project limits without the written permission of the Engineer. Material or debris that is disposed of within the project limits shall be buried to a depth of at least 2 feet and the surface shall be reshaped to match the adjacent ground line. The Contractor shall make all arrangements to obtain written permission from property owners for disposal locations outside the limits and view of the project. Copies of this written agreement shall be furnished to the Engineer before the disposal area is used.

All cleared merchantable timber shall be removed from the project and shall become the property of the Contractor.

Branches on trees or shrubs shall be removed as directed. Branches of trees extending over the roadbed shall be trimmed to give a clear height of 20 feet above the roadbed surface. All trimming shall be done in accordance with good tree surgery practices.

The Contractor shall scalp the areas within the excavation or embankment grading limits. Mowed sod need not be removed where the embankment to be constructed is 4 feet or more in height. Scalping shall include the removal from the ground surface of brush, roots, sod, grass, residue of agricultural crops, sawdust, and other vegetable matter. See subsection 208.04(e) for disturbed area limits.

METHOD OF MEASUREMENT

201.03 Measurement will be by one of the following methods:

- (a) *Area Basis.* The work to be paid for will be the number of acres acceptably cleared and grubbed, including scalping, within the limits shown on the plans or staked by the Engineer.
- (b) *Lump Sum Basis.* When the Contract contains a clearing and grubbing lump sum item, no measurement will be made.

BASIS OF PAYMENT

201.04 The accepted quantities of clearing and grubbing will be paid for at the contract unit prices as follows:

- (a) *Area Basis.* The quantities will be paid for at the contract unit price bid per acre for each pay item that appears in the bid schedule.
- (b) *Lump Sum Basis.* When the bid schedule contains a lump sum item, the lump sum price so bid will be paid and shall be full compensation for clearing and grubbing the entire project.

Clearing and grubbing beyond the limits designated under this item will be paid for as Extra Work in accordance with subsection 104.03.

Payment will be made under:

Pay Item	Pay Unit
Clearing	Acre, Lump Sum
Grubbing	Acre, Lump Sum
Clearing and Grubbing	Acre, Lump Sum

- (c) *Exclusions.* When the bid schedule does not contain an estimated quantity or a lump sum item for clearing and grubbing, the work will not be paid for separately, but shall be included in the work.

SECTION 202 REMOVAL OF STRUCTURES AND OBSTRUCTIONS

DESCRIPTION

202.01 This work consists of the removal and disposal of trees, slope and ditch protection, abandoned utility services, curb, gutter, pipes, sidewalk, structures, bridges or parts of bridges, railroad appurtenances, traffic control devices, impact attenuators, guardrail, fences, foundations, detours, pavements, pavement markings, and all other obstructions that are not designated or permitted to remain. It shall also include salvaging, stockpiling and loading salvable materials, sandblasting, plugging structures, cleaning culverts, and sawing and cutting to facilitate controlled breaking and removal of concrete and asphalt to a neat line. Except in areas to be excavated, the resulting trenches, holes, and pits shall be backfilled. This work also consists of plugging and abandoning water wells as designated in the Contract.

Materials removed and not designated in the Contract to be salvaged or incorporated into the work shall become the property of the Contractor.

CONSTRUCTION REQUIREMENTS

202.02 General. The Contractor shall raze, remove, and dispose of all structures and obstructions which are identified on the project, except utilities, structures and obstructions removed under other contractual agreements, and salvable material designated to remain the property of the Department.

Basements and other cavities left by structure removal shall be filled to the level of the surrounding ground with suitable material and, if within the construction limits, shall be compacted in accordance with subsection 203.06.

Bridges, culverts, and other drainage structures shall not be removed until satisfactory arrangements have been made to accommodate traffic and drainage.

Blasting or other operations used to remove existing structures or obstructions, which may damage new construction, shall be completed prior to placing the new work.

Where portions of structures are to be removed, the portions designated to remain shall be prepared to fit the new construction, and shall be protected from damage. All damage to structures designated to remain in place shall be repaired at the Contractor's expense. Method of repair shall be approved by the Engineer.

Sawing of concrete shall be done to a true line, with a vertical face, unless otherwise specified. The minimum depth of a saw cut in concrete shall be 2 inches or to the depth of the reinforcing steel, whichever occurs first.

Removed concrete and asphalt material may be used to construct embankments in accordance with subsection 203.06.

Where culverts or sewers are to be left in place and plugged, the ends of concrete or masonry culverts shall be filled with suitable material. The ends of corrugated metal pipe culverts shall be crushed. Culvert and sewer ends are to be sufficiently filled or crushed to prevent future settlement of embankments. Plugging of culverts shall include removal of headwalls and other appurtenances where necessary to accommodate the work.

Procedures for abandoning water wells shall conform to the Revised and Amended Rules and Regulations of the State of Colorado, Division of Water Resources, Board of Examiners of Water Well Construction and Pump Installation Contractors, (Board). The State Engineer who acts for the Board is located at 818 Centennial Bldg., 1313 Sherman St., Denver, CO 80203 (Phone 303-866-3587).

The Contractor shall properly plug and abandon the designated wells and file an abandonment report for each. An abandonment report shall be prepared using Form GWS-9 obtained from the Board at the above address. The report shall describe the well location and how it was plugged. This report shall be submitted to the Board, with a copy given to the Project Engineer, within 60 days after performing the work.

Existing guardrail shall not be removed unless the need for the guardrail has been eliminated or the hazard has been protected or delineated. The duration and manner of protection or delineation shall be submitted in writing for approval by the Engineer.

202.03 Salvable Material. All salvable material designated in the Contract to remain the property of the Department shall be removed without damage, in sections or pieces which may be readily transported, and shall be stockpiled by the Contractor at specified locations within the project limits. The Contractor shall safeguard salvable materials and shall be responsible for the expense of repairing or replacing damaged or missing material until it is incorporated into the work, or is loaded onto Department equipment by the Contractor.

202.04 Signs and Traffic Signals. Removal of signs shall include removal of posts, footings, pedestals, sign panels, and brackets. Concrete adhering to salvable sign posts shall be removed.

Removal of sign panel shall include removal of the panel and its attachment hardware from the existing installation and adjusting the spacing of the remaining panels.

The removal of traffic signal items shall include poles, mast arms, signal heads, span wires, footings, all attachment hardware, and other incidental materials. Removal of signal pole or pedestal pole shall include pole, span wire, cable, signal heads, overhead sign support wire, footings, and pedestrian push buttons. Removal of traffic signal controller and cabinet shall include removal of the footing and all auxiliary equipment contained within the cabinet.

202.05 Pavement Markings. Pavement markings shall be removed from the pavement to the maximum extent possible, by methods that do not materially alter or damage the surface or texture of the pavement, to the satisfaction of the Engineer. The proposed method of pavement marking removal shall be designated by the Contractor at the preconstruction conference, and approved by the Engineer. Operations that do not produce the desired result, damage the pavement, or may constitute a hazard to the traveling public will not be permitted. Materials deposited on the pavement as a result of removal of pavement markings shall be promptly removed so as not to interfere with traffic or roadway drainage.

Pavement markings, designated to be removed, shall be removed before any change is made in traffic patterns. Temporary marking tape sections longer than one foot shall be removed before placement of the final pavement course. All tape shall be removed on sections where tape conflicts with revised traffic lanes prior to opening of new lanes to traffic.

The pavement surface area to be covered with pavement marking material shall be sandblasted, or blast cleaned by another approved method, prior to the application of pavement primer or prior to the placing of pavement marking material when used without a pavement primer. A dustless-abrasive shot blasting, power washing, or other approved cleaning method may be used to do the sandblasting work. The sandblast shall be applied to remove all dirt, laitance, and curing compound residue. After sandblasting, all loose dust and dirt shall be removed before application of pavement primer or pavement marking material.

202.06 Detours. The Contractor shall completely remove the detour and dispose of the materials in accordance with the Contract.

202.07 Pavements, Sidewalks, Curbs. All concrete pavement, sidewalks, structures, curbs, gutters, etc., designated for removal, shall be disposed of in accordance with subsection 201.02. Concrete pavement to be broken and left in place shall be broken so the largest fragment does not exceed 1 square yard in surface.

202.08 Portions of structures. Unless otherwise directed, the substructures of existing structures shall be removed down to the natural stream bottom and those parts outside of the stream shall be removed down 1 foot below natural ground surface. Where such portions of existing structures lie wholly or in part within the limits of a new structure, they shall be removed as necessary to accommodate the construction of the proposed structure.

Reinforcing steel projecting from the structure, designated to remain, shall be cleaned and aligned to the new construction. Required dowels shall be securely grouted with approved grout. When concrete is removed, all exposed reinforcing steel designated to remain in place shall be cleaned by sandblasting to sound steel free of oil, dirt, concrete fragments or laitance, loose rust scale, and other coatings that would destroy or inhibit the bond with the new concrete.

Adequate measures shall be taken by the Contractor to protect the steel from contamination or corrosion. Reinforcing steel, contaminated as a result of the Contractor's failure to provide adequate protection, shall be resandblasted at the Contractor's expense with no allowance for contract time extension.

A protective device shall be placed between the sandblasting operations and the traveling public.

202.09 Removal of Asphalt Mat (Planing). The Contractor shall not commence planing operations until the hot mix asphalt (HMA) Mix Design (CDOT Form 43) has been approved and signed.

Prior to beginning planing operations, the Contractor shall submit a planing plan for approval by the Engineer. This plan shall include as a minimum:

- (1) The number and types of planers to be used.
- (2) The width and location of each planing pass.
- (3) The number and types of brooms to be used, and their locations with respect to the planers. The Contractor shall have at least one back-up broom on the project at all times in case one of the operating brooms breaks down.

Each planer shall conform to the following:

The planer shall have sufficient power, traction, and stability to maintain an accurate depth of cut. The propulsion and guidance system of the planer shall be maintained in such condition that the planer may be operated to straight and true lines.

Operation with broken or missing teeth will not be allowed. Worn teeth shall be replaced if the planer does not produce a uniform surface.

The planer shall be capable of picking up the removed asphalt in a single operation. A self loading conveyer shall be an integral part of the planer. Windrows will not be allowed.

All planed areas shall be broomed with a pick up broom, unless otherwise specified, before being opened to traffic. A sufficient number of brooms shall be used immediately after planing to remove all planed material remaining on the roadway.

If the Contractor fails to adequately clean the roadway, work shall cease until the Engineer has approved the Contractor's revised written proposal to adequately clean the roadway.

At the completion of each days work, vertical edges caused by planing that are greater than 1 inch in height shall be: Longitudinal - tapered to not less than a 3:1 slope, Transverse - tapered to not less than a 50:1 slope.

The roadway shall be left in a safe and usable condition at the end of each work day. All required pavement markings, removed by the planing, shall be restored before the roadway is opened to traffic.

All planing shall be completed parallel to the travel lanes unless otherwise directed by the Engineer.

All planing shall be completed full width before resurfacing commences.

202.10 Clean Culvert. Culverts designated in the Contract to be cleaned shall be cleaned by removing all sedimentation and debris from within the culvert and all appurtenant structures.

METHOD OF MEASUREMENT

202.11 When the Contract provides payment for removal of obstructions on a lump sum basis, this payment will include all stipulated structures and obstructions encountered within the right of way in accordance with this section. When the Contract provides payment for the removal of specific items on a unit basis, measurement will be by the unit.

Removal of pavement marking will be measured in square feet, completed and accepted. Sandblasting of pavement that is to be covered with pavement marking material will be measured as the same area as measured for the pavement marking for which the sandblasting is required.

Removal of temporary pavement markings will not be measured and paid for separately but shall be included in the work.

Removal of asphalt mat (planing) will be measured by the area in square yards, completed to the required depth, and accepted.

Sandblasting reinforcing steel will be measured by the square yard of deck surface. Multiple layers of reinforcing steel within a common area of the deck exposed and requiring sandblasting will not be measured separately.

Clean culvert will be measured by the number of culverts acceptably cleaned as designated on the plans, irrespective of the kind or size involved.

Abandon well will be measured by the actual number plugged, abandoned, and the abandonment report submitted.

BASIS OF PAYMENT

202.12 The accepted quantities will be paid for at the contract unit price for each of the pay items listed below that appear in the bid schedule. Payment shall be full compensation for sawing, removing, disposal, excavation and subsequent backfill, and salvage of materials removed, their custody, preservation, storage, and disposal as provided herein.

Payment will be made under:

Pay Item	Pay Unit
Removal of Structures and Obstructions	Lump Sum
Removal of	Each, Linear Foot, Square Yard Cubic Yard
Removal of Asphalt Mat (Planing)	Square Yard
Plug	Each
Clean Culvert	Each
Abandon Well	Each
Sandblasting	Square Foot
Sandblasting Reinforcing Steel	Square Yard

When the Contract does not include pay items for removal of structures and obstructions, the removal will not be paid for separately but shall be included in the work.

Payment for abandon well will be full compensation for all labor and materials required to complete the work, including preparing and submitting the abandonment report.

SECTION 207 TOPSOIL

DESCRIPTION

207.01 This work consists of salvaging and stockpiling topsoil, and excavating suitable topsoil from stockpiles, contractor sources, available sources, or from the approved natural ground cover to place on designated areas. It shall include the placing of topsoil upon constructed cut and fill slopes after grading operations are completed.

MATERIALS

207.02 Topsoil shall consist of loose friable soil from the zone of major root development free of subsoil, refuse, stumps, woody roots, rocks, brush, noxious weed seed and reproductive plant parts from current state and county weed lists, heavy clay, hard clods, toxic substances, or other material which would be detrimental to its use on the project.

Wetland topsoil material shall consist of the moist, organic soil, including any existing wetland vegetation and seeds, to be excavated from areas as shown on the plans or as directed.

CONSTRUCTION REQUIREMENTS

207.03 Wetland topsoil material shall be excavated from the designated area to a maximum depth of 12 inches, or as otherwise designated, and placed within 24 hours in the specified area. The Contractor shall prepare the relocation site to elevations specified and approved by the Engineer prior to excavating the wetlands. If the Engineer determines that this is not possible, then the Contractor shall stockpile the material in an approved area, to remain undisturbed until the relocation site has been prepared. Storage time within the stockpile shall be as short as possible. Wetland topsoil material shall be placed over the prepared relocation areas to a depth of 12 inches, or as otherwise designated.

Topsoil within the limits of the roadway shall be salvaged prior to beginning hauling, excavating, or fill operations by excavating and stockpiling the material at designated locations in a manner that will facilitate measurement, minimize sediment damage, and not obstruct natural drainage. Topsoil shall be placed directly upon completed cut and fill slopes whenever conditions and the progress of construction will permit.

Topsoil shall be placed at locations and to the thickness provided in the Contract and shall be keyed and tracked to the underlying material without creating a compacted surface by the use of harrows, bulldozers, rollers, or other equipment suitable for the purpose.

Salvaged topsoil exceeding the quantity required under the Contract shall be disposed of at locations acceptable to the Engineer.

METHOD OF MEASUREMENT

207.04 Topsoil salvaged from the roadway and placed in stockpiles shall be measured in the stockpile in cubic yards by the method of average end areas and paid for as Stockpile Topsoil.

Topsoil salvaged from the roadway, taken from stockpiles or from approved pits, hauled and placed directly upon completed cut and fill slopes shall be measured at its source in cubic yards, as described in subsection 203.13, and paid for as Topsoil.

Topsoil generated from the roadway and placed in windrows will be measured at its source in cubic yards, as described in subsection 203.13, and paid for as Stockpile Topsoil. When it is subsequently placed upon the completed cut and fill slopes, the same quantity will be paid for as Topsoil, except that adjustment in quantity shall be made if the total windrowed quantity is not utilized.

Wetland topsoil material excavated from areas within the right-of-way and placed in stockpiles will be measured in the stockpile by the method of average end areas and paid for as Stockpile Wetland Topsoil.

Wetland topsoil material excavated from areas within the right-of-way or from stockpiles, hauled and placed directly on a relocated site will be measured at its source in cubic yards, as described in subsection 203.13, and paid for as Wetland Topsoil.

Topsoil secured from the Contractor's source will be measured in place by measuring random depths of topsoil, and computing the volume by multiplying the area times the average depth

BASIS OF PAYMENT

207.05 The accepted quantities measured as provided above will be paid for at the contract unit price per cubic yard for each of the pay items listed below that appear in the bid schedule.

Payment will be made under:

Pay Item	Pay Unit
Stockpile Topsoil	Cubic Yard
Topsoil	Cubic Yard
Stockpile Wetland Topsoil	Cubic Yard
Wetland Topsoil	Cubic Yard

SECTION 208 EROSION CONTROL

DESCRIPTION

208.01 This work consists of constructing, installing, maintaining, and removing when required, Best Management Practices (BMPs) during the life of the Contract to prevent or minimize erosion, sedimentation, and pollution of any state waters as defined in subsection 107.25, including wetlands.

The Contractor shall coordinate the construction of temporary BMPs with the construction of permanent BMPs to assure economical, effective, and continuous erosion and sediment control throughout the construction period.

When a provision of Section 208 or an order by the Engineer requires that an action be immediate or taken immediately, it shall be understood that the Contractor shall at once begin effecting completion of the action and pursue it to completion in a manner acceptable to the Engineer, and in accordance with the Colorado Discharge Permit System Stormwater Construction Permit (CDPS-SCP) requirements.

MATERIALS

208.02 The material for BMPs shall conform to the following:

- (a) *Erosion Bales:* Material for erosion bales shall consist of Certified Weed Free hay or straw. The hay or straw shall be certified under the Colorado Department of Agriculture Weed Free Forage Certification Program and inspected as regulated by the Weed Free Forage Act, Title 35, Article 27.5, CRS. Each certified weed free erosion bale shall be identified by blue and orange twine binding the bales.

The Contractor shall not place certified weed free erosion bales or remove their identifying twine until the Engineer has inspected and accepted them.

The Contractor shall provide a certificate of compliance (COC) showing the transit certificate number or a copy of the transit certificate as supplied from the forage producer.

The Contractor may obtain a current list of Colorado Weed Free Forage Crop Producers who have completed certification by contacting the Colorado Department of Agriculture, Weed Free Forage Program, 700 Kipling Street, Suite 4000, Lakewood, CO 80215, (303) 239-4177.

Bales shall be approximately 5 cubic feet of material and weigh at least 35 pounds. Stakes shall be wood and shall be 2 inch by 2 inch nominal.

- (b) *Silt Fence.* Silt fence posts shall be wood with a minimum length of 42 inches. Wood posts shall be 1.5 inch by 1.5 inch nominal. Geotextile shall be attached to wood posts with three or more staples per post.

Silt fence geotextile shall conform to the following requirements:

Physical Requirements for Silt Fence Geotextiles

Property	Wire Fence Supported Requirements	Self Supported Requirements Geotextile Elongation <50%	Test Method
Grab Strength, lbs	90 Minimum	124 Minimum	ASTM D 4632
Permittivity sec-1	0.05	0.05	ASTM D 4491
Ultraviolet stability	Minimum70% Strength Retained	Minimum70% Strength Retained	ASTM D 4355

- (c) *Temporary Berms.* Temporary berms shall be constructed of compacted soil.
- (d) *Temporary Slope Drains.* Temporary slope drains shall consist of fiber mats, plastic sheets, stone, concrete or asphalt gutters, half round pipe, metal or plastic pipe, wood flume, flexible rubber or other materials suitable to carry accumulated water down the slopes. Outlet protection riprap shall conform to section 506. Erosion control geotextile shall be a minimum Class 2, conforming to subsection 712.08.
- (e) *Silt Berm.* Silt berm shall consist of an ultraviolet (UV) stabilized high-density polyethylene, shall be triangular in shape, and shall have the following dimensions:

Width	6 - 11 inches
Height	6 - 10 inches
Weight	0.3 - 1.4 lbs./sq. ft.
Percent Open Area	30 - 50%

Securing spikes shall be 10 to 12 inch x 0.375 inch diameter (minimum).

- (f) *Rock Check Dam.* Rock Check dams shall be constructed of stone. Stone shall meet the requirements of Section 506.
- (g) *Sediment Trap.* In constructing an excavated Sediment Trap, excavated soil may be used to construct the dam embankment, provided the soil meets the requirements of subsection 203.03. Outlet protection riprap shall be the size specified in the Contract and shall conform to Section 506. Erosion control geotextile shall be a minimum Class 1, conforming to subsection 712.08.
- (h) *Erosion Logs.* Erosion logs shall be curled aspen wood excelsior with a consistent width of fibers evenly distributed throughout the log. The casing

shall be seamless, photodegradable tube netting and shall have minimum dimensions as shown in Table 208-1, based on the diameter of the log called for on the plans. The curled aspen wood excelsior shall be fungus free, resin free, and free of growth or germination inhibiting substances.

Table 208-1
Nominal Dimensions of Erosion Logs

Diameter	Length	Weight (minimum)	Stake Dimensions
12 inch	10 feet	2.5 pounds/foot	1.25 by 1.25 by 24 inches
20 inch	10 feet	4 pounds/foot	2 by 2 by 30 inches

Stakes to secure erosion logs shall consist of pinewood or hardwood.

- (i) *Silt Dikes.* Silt dikes shall be premanufactured triangular shaped urethane foam covered with a woven geotextile fabric. The fabric aprons shall extend a minimum of two feet beyond each side of the triangle.

Each silt dike shall have the following dimensions:

Dimension	Length
Center height	8 to 10 inches
Base	16 to 21 inches
Section length	3 to 7 feet
Section width including fabric extensions	5.6 feet
Staples shall be 6 gauge and at least 8 inches long.	

- (j) *Concrete Washout Structure.* The Contractor shall construct a washout structure that will contain washout from concrete placement and construction equipment cleaning operations. Embankment required for the concrete washout structure may be excavated material, provided that this material meets the requirements of Section 203 for embankment.

Fabricated concrete washout structures may be used. Fabricated concrete washouts are pre-manufactured watertight containers designed to contain liquid and solid waste from concrete washout. Only the fabricated concrete washout structures listed on CDOT's Approved Product List may be used. After use, the structure shall be removed from the project site and disposed of at the Contractor's expense.

- (k) *Vehicle Tracking Pad.* Aggregate for the vehicle tracking pad shall be crushed natural aggregate with at least two fractured faces that meets the following gradation requirements:

Sieve size	Percent by weight Passing Square Mesh Sieves
75 mm (3 inch)	100
50 mm (2 inch)	0-25
19.0 mm (¾ inch)	0-15

Recycled crushed concrete or asphalt shall not be used for vehicle tracking pads.

Geotextile (Erosion Control) shall be Class 2 and conform to the requirements of subsection 420.02.

- (l) *Gravel Bag.* Gravel bags shall consist of aggregate filled fabric with the following dimensions:

Diameter	4 to 6 inches
Section Length	1 foot minimum

The sediment control device shall consist of a woven geotextile fabric with the following properties:

Property	Requirement	Test Method
Grab Tensile Strength	90 lbs. min.	ASTM D 4632
Trapezoid Tear Strength	25 lbs. min.	ASTM D 4533
Mullen Burst	300 psi.	ASTM D 3786
Ultraviolet Resistance	70%	ASTM D 4355

Aggregate contained in the gravel bags shall consist of gravel or crushed stone conforming to Table 703-7 for Class C.

- (m) *Storm Drain Inlet Protection.* Storm drain inlet protection for curb inlets shall consist of aggregate filled fabric with the following dimensions:

Storm Drain Inlet Protection Properties	Protection Type	
	¹ Type I	² Type II
Diameter	4 in.	4 in.
Minimum Section Length	7 ft.	5 ft.
Apron Insert	—	30 in. or sized to grate
¹ Type I protection shall be used with Inlet Type R.		
² Type II protection shall be used with Inlet Type 16.		

The inlet protection device shall consist of a woven geotextile fabric with the following properties:

Property	Test Method	Unit	Requirement
Grab Tensile Strength	ASTM D 4632	lbs.	minimum 450x300
Trapezoid Tear Strength	ASTM D 4533	lbs.	minimum 160x170
Mullen Burst Strength	ASTM D 3786	lbs.	550
Percent Open Area	COE-22125-86	%	10
Water Flow Rate	ASTM D 4491	gal./min./ft.	210
Ultraviolet Resistance	ASTM D 4355	%	90

Storm drain inlet protection shall have an approximate weight of 7 to 10 pounds per linear foot of device. The device shall be capable of conforming to the shape of the curb. Aggregate contained in the storm drain inlet device shall consist of gravel or crushed stone conforming to Table 703-7 for Class C.

CONSTRUCTION REQUIREMENTS

208.03 Project Review, Schedule, and Erosion Control Supervisor. Prior to construction, an on-site environmental preconstruction conference shall be held. The conference shall be attended by:

- (1) The Engineer.
- (2) The Superintendent.
- (3) The Contractor's ECS.
- (4) Supervisors of Subcontractors working on the project.
- (5) The Region Water Pollution Control Manager.
- (6) The CDOT landscape architect or CDOT personnel who prepared or reviewed the stormwater management plan (SWMP).

At this conference, the attendees shall discuss the stormwater management plan, CDPS-SCP, sensitive habitats on site, wetlands, and other vegetation to be protected.

Prior to beginning construction the Contractor shall evaluate the project site for storm water draining into or through the site. When such drainage is identified, BMPs shall be used if possible to divert stormwater from running on-site and becoming contaminated with sediment or other pollutants. The diversion may be accomplished with a temporary pipe or other conveyance to prevent water contamination. Run-on water that cannot be diverted shall be treated as construction runoff and adequate BMPs shall be employed.

The ECS shall evaluate all non-stormwater coming onto the site, such as springs, seeps, and landscape irrigation return flow. If such flow is identified, BMPs shall be used to protect off-site water from becoming contaminated with sediment or other pollutants.

The ECS shall review existing inlets and culverts to determine if inlet protection is needed due to water flow patterns. Prior to beginning construction, inlets and culverts needing protection shall be protected and the location of the implemented BMP added to the SWMP site map.

Prior to construction the Contractor shall implement BMPs in accordance with the approved project schedule as described in subsection in 208.03(b).

Prior to construction other than the installation of BMPs, the Engineer, the Region Water Pollution Control Manager, the ECS, and the Superintendent shall inspect the project to determine whether the BMPs described in the plans and the site-specific SWMP are installed and located correctly for the initial phase of the Contractor's work. Notice shall be given to all participants at least 3 working days in advance.

When additional BMPs are required and approved by the Engineer, the Contractor shall implement the additional BMPs and the ECS shall record and describe them on the SWMP site map. The approved BMPs will be measured and paid for in accordance with subsections 208.11 and 208.12.

(a) *Project Review.* The Contractor may submit modifications to the Contract's BMPs in a written proposal to the Engineer. The written proposal shall include the following information:

- (1) Reasons for changing the BMPs.
- (2) Diagrams showing details and locations of all proposed changes.
- (3) List of appropriate pay items indicating new and revised quantities.
- (4) Schedules for accomplishing all erosion and sediment control work.
- (5) Effects on permits or certifications caused by the proposed changes.

The Engineer will approve or reject the written proposal in writing within 5 working days after the submittal. The Engineer may require additional control measures prior to approving the proposed modifications.

(b) *Erosion and Sediment Control Activities.* The erosion and sediment control activities shall be included in the CPM or bar chart project schedule. The project schedule shall specifically indicate the sequence of clearing and grubbing, earthwork operations, and construction of temporary and permanent erosion control features and stabilization. The project schedule shall include erosion and sediment control work for haul roads, borrow pits, storage and plant sites, and all areas within the project limits.

If during construction the Contractor proposes changes which would affect the Contract's BMPs, the Contractor shall propose revised BMPs to the Engineer for approval in writing. If necessary, the ECS shall update proposed sequencing of major activities in the SWMP. Revisions shall not be implemented until the proposed measures have been approved in writing by the Engineer.

- (c) *Erosion Control Supervisor.* When included in the Contract, the Contractor shall assign to the project an individual to serve in the capacity of the Erosion Control Supervisor (ECS). The ECS shall be a person other than the Superintendent. The ECS shall be experienced in all aspects of construction and have satisfactorily completed an ECS training program authorized by the Department. Proof that this requirement has been met shall be submitted to the Engineer prior to or at the environmental preconstruction conference. A list of authorized ECS training programs will be provided by the Engineer upon request by the Contractor. The ECS shall act as the SWMP Administrator on the project. The SWMP Administrator shall be responsible for oversight of the implementation, maintenance, and revision of the SWMP for the duration of the project. The ECS shall use the information provided in CDOT's *Erosion Control and Stormwater Quality Guide* and the *CDPS-SCP*.

The ECS's responsibilities shall be as follows:

- (1) Ensure compliance with the Stormwater Construction Permit.
- (2) Supervise the installation, construction, and maintenance of all BMPs specified in the Contract and coordinate the construction of BMPs with all other construction operations.
- (3) Direct the implementation of suitable temporary erosion and sediment control features as necessary to correct unforeseen conditions or emergency situations. Direct the dismantling of those features when their purpose has been fulfilled unless the Engineer directs that the features be left in place.
- (4) Inspect with the Superintendent and the Engineer the stormwater management system at least every 14 calendar days. Post storm event inspections shall be conducted within 24 hours after the end of any precipitation or snow melt event that may cause surface erosion. If no construction activities will occur following a storm event, post-storm event inspections shall be conducted prior to commencing construction activities, but no later than 72 hours following the storm event. The occurrence of any such delayed inspection must be documented in the inspection report. CDOT Form 1176 shall be used for all 14 day inspections and inspections following storm events.

Inspections are not required at sites when construction activities are temporarily halted, when snow cover exists over the entire site and melting conditions do not pose a risk of surface erosion. This exception is applicable only during the period where melting conditions do not exist, and applies to the routine 14-day and monthly inspections, as well as the post-storm event inspections. The following information shall be documented on CDOT Form 1176 for use of this exclusion: dates when snow cover occurred, date when construction activities ceased, and date melting conditions began.

The order of precedence for required inspections shall be as follows:

- (i) ECAT/RECAT
- (ii) Monthly audit
- (iii) 14 day
- (iv) Daily

When one of the listed inspections is performed, the inspections listed below it need not be performed on that day if the required CDOT and Contractor personnel participated in the inspection. For example:

A daily inspection is not required on the same day a 14 day inspection is conducted. A sheet shall be placed in the daily log to refer to the 14 day inspection for that day.

- (5) The ECS or the Superintendent, if the Superintendent is certified as an ECS, shall conduct an inspection on each day in which active construction has occurred. At this inspection the portion of the site under active construction shall be reviewed to determine whether construction is being conducted in accordance with the project's site-specific SWMP and the CDPS-SCP. The ECS or Superintendent shall observe, record, and determine the effectiveness of all BMPs. Inspections shall be recorded on CDOT Form 1388 and kept in the project SWMP notebook.
- (6) Attend the Preconstruction Conference, environmental preconstruction conference, project scheduling meetings, weekly meetings and other meetings regarding construction that could impact water quality, CDOT monthly audits, and reviews by the Erosion Control Assessment Team (ECAT) and Regional Erosion Control Assessment Team (RECAT) as requested by the Engineer. The Contractor will be notified two days in advance of each ECAT and each RECAT.
- (7) Coordinate with the Superintendent to implement necessary actions to reduce anticipated or presently existing water quality or erosion problems resulting from construction activities.
- (8) Coordinate with the Superintendent to ensure that all labor, material, and equipment needed to install, maintain, and remove BMPs are available as needed.
- (9) During construction, update and record the following items on the SWMP site map as changes occur:
 - (i) Construction boundaries.
 - (ii) Areas of disturbance.
 - (iii) Areas used for storage of construction materials, equipment, soils, or wastes.
 - (iv) Location of any dedicated asphalt or concrete batch plants.

- (v) Location of construction offices and staging areas.
- (vi) Location of work access routes during construction.
- (vii) Location of borrow and waste.
- (viii) Location of temporary and permanent stabilization

The ECS shall start a new site map before the current one becomes illegible. All site maps shall remain in the SWMP notebook.

- (10) Amend the SWMP whenever there are: additions, deletions, or changes in locations of BMPs. SWMP revisions shall be recorded immediately. Items shall be dated and signed at time of occurrence. Specifically, amendments shall include the following:
- (i) A change in design, construction, operation, or maintenance of the site which would require the implementation of new or revised BMPs; or
 - (ii) Changes when the SWMP proves to be ineffective in achieving the general objectives of controlling pollutants in stormwater discharges associated with construction activity.
 - (iii) Changes when BMPs are no longer necessary and are removed.

All inspection and maintenance activities or other repairs shall be documented. The SWMP and documentation shall be kept on the project site.

- (11) Modify the site map with arrows to indicate direction of surface and storm water flowing across the project site.
- (12) When adding or revising BMPs on the SWMP, add a narrative explaining what, when, where, why, and how the BMP is being used, and add a detail to the SWMP notebook.
- (13) If using existing topography, vegetation, etc. as a BMP, label it as such on the SWMP site map; add a narrative as to when, why, and how the BMP is being used to the SWMP.
- (14) Cross out all BMPs on standard plan M-208-1 in the SWMP notebook that do not apply or highlight those details on Standard Plan M-208-1 that apply to the project.
- (15) Record on the SWMP, and implement the approved plan for concrete and asphalt saw cutting, grinding, and milling containment and removal.
- (16) Update the potential pollutants list in the SWMP notebook and Spill Prevention, Control, and Countermeasure Plan (SPCC) throughout construction.

Spills, leaks, or overflows that result in the discharge of pollutants shall be documented on the Form 1176 or 1388 by the ECS. The ECS shall record the time and date, weather conditions, reasons for spill, and how it was remediated.

The ECS shall immediately report to the Engineer the following instances of noncompliance:

- (1) Noncompliance which may endanger health or the environment.
 - (2) Spills or discharge of hazardous substance or oil which may cause pollution of waters of the State.
 - (3) Discharge of stormwater which may cause an exceedance of a water quality standard.
- (d) *Documentation Available on the Project.* The following Contract documents and references will be made available for reference at the CDOT field office during construction.
1. SWMP Notebook. The Engineer will provide a SWMP Notebook, which is and shall remain the property of CDOT. CDOT will provide the items available at the time of the award including the first 4 items below. The notebook will be stored in the CDOT field office or at another on-site location approved by the Engineer. The following Contract documents and reports shall be kept, maintained, and updated in the notebook by the ECS:
 - (1) SWMP Plan Sheets.
 - (2) SWMP site map and project plan title sheet.
 - (3) Copies of subsection 107.25, and Sections 207, 208, 212, 213, and 216 of the Standard Specifications, and the standard and project special provisions that modify them.
 - (4) Standard Plan M-208-1.
 - (5) Details of BMPs used on the project not covered in Standard Plan M-208-1.
 - (6) Plan sheets and specifications for permanent water quality structures, riprap, and temporary stream crossings.
 - (7) Narratives related to BMPs used on the project not covered on the SWMP plans or site maps.
 - (8) Calendar for marking when all inspections except the daily inspections take place.
 - (9) All project environmental permits and associated applications and certifications, including, CDPS-SCP, Senate Bill 40, USACE 404, dewatering, and all other permits applicable to the project, including any separate CDPS-SCP obtained by the Contractor for staging area on private property, asphalt or concrete plant, etc.
 - (10) List of potential pollutants as described in subsection 107.25.
 - (11) SPCC and reports of reportable spills submitted to CDPHE.
 - (12) Form 1176 Inspection reports and ECAT and RECAT reports and documentation of the corrective actions for any findings.

- (13) Form 105s and all other correspondence relating to water quality.
- (14) Description of inspection and maintenance methods implemented at the site to maintain all BMPs identified in the SWMP.
- (15) Schedule for accomplishing temporary and permanent erosion control work in accordance with subsection 208.03(b), the weekly meeting agenda, and the meeting sign in sheet.
- (16) Erosion Control Supervisor's certification and Superintendent's ECS certification if acting as a substitute for the ECS for daily inspections.
- (17) Environmental preconstruction conference agenda with a certification of understanding of the terms and conditions of the CDPS-SCP and SWMP. The certification shall be signed by all attendees. A certification shall also be signed by all attendees of meetings held for new subcontractors beginning work on the project that could adversely affect water quality after the Environmental Preconstruction Conference has been held.
- (18) Form 1388 Daily Stormwater Logs.
- (19) Monthly audit reports provided by the Region Water Pollution Control Manager.
- (20) Project photographs documenting existing vegetation prior to construction commencing.

The Engineer will incorporate the documents and reports available at the time of award. The Contractor shall provide and insert all other documents and reports as they become available during construction.

2. Reference Materials

- (1) CDOT *Erosion Control and Stormwater Quality Guide*.
 - (2) CDOT *Erosion Control and Stormwater Quality Field Guide*.
 - (3) Copy of biological opinion, if applicable.
- (e) *Weekly Meetings*: The Engineer, Superintendent and the ECS shall conduct a weekly meeting with supervisors involved in construction activities that could adversely affect water quality. The meeting shall follow an agenda prepared by the Superintendent and have a sign in sheet on which the names of all attendees shall be recorded. The agenda and sign in sheet shall be placed in the SWMP notebook. At this meeting the following shall be discussed:
- (1) Requirements of the SWMP.
 - (2) CDPS-SCP.
 - (3) Problems that may have arisen in implementing the site specific SWMP or maintaining BMPs.
 - (4) Unresolved issues from the daily stormwater log shall be discussed.

(5) BMPS that are to be constructed, removed, modified, or maintained.

If a subcontractor who did not attend the environmental pre-construction conference begins work that could adversely affect water quality, the Engineer and Superintendent shall brief that subcontractor's supervisors on the site's SWMP and the CDPS-SCP requirements at that subcontractor's first weekly meeting before the subcontractor begins work at the site.

208.04 Best Management Practices for Stormwater.

The ECS shall modify the SWMP to clearly describe and locate all BMPs implemented at the site to control potential sediment discharges from vehicle tracking.

Vehicle tracking pads shall be used at all vehicle and equipment access points to the site to prevent sediment exiting the project site onto paved public roads. Access shall be provided only at locations approved by the Engineer. The ECS shall record vehicle tracking pad locations on the SWMP site map.

New inlets and culverts shall be protected during their construction. Appropriate protection of each culvert and inlet shall be installed immediately upon its completion. When riprap is called for at the outlet of a culvert, it shall be installed within 24 hours of completion of each pipe. The Contractor shall remove sediment, millings, debris, and other pollutants from within the newly constructed drainage system, prior to use, at the Contractor's expense.

Concrete wasted on the ground during construction shall be collected, removed from the project site, and disposed of properly. Wasted concrete includes excess concrete removed from forms, spills, slop, and all other unused concrete that ends up on the ground.

- (a) *Unforeseen Conditions.* The Contractor shall design and implement erosion and sediment control measures for correcting conditions unforeseen during the design of the project, or for emergency situations, that develop during construction. The Department's *Erosion Control and Stormwater Quality Guide* shall be used as a reference document for the purpose of designing erosion and sediment control measures. Measures and methods proposed by the Contractor shall be reviewed and approved in writing by the Engineer prior to installation.
- (b) *Other Agencies.* If CDPHE, US Army Corps of Engineers (USACE), or the Environmental Protection Agency (EPA) reviews the project site and requires additional measures to prevent and control erosion, sediment, or pollutants, the Contractor shall cease and desist activities resulting in pollutant discharge and immediately implement these measures.
- (c) *Work Outside the Right of Way.* Disturbed areas, including staging areas, that are outside CDOT ROW and outside easements acquired by CDOT for construction are the responsibility of the Contractor. These areas are subject to a separate CDPS-SCP. The Contractor shall acquire these permits and

submit copies to the Engineer prior to any disturbance. These permits, shall be acquired and all erosion and sediment control work performed at the Contractor's expense.

- (d) *Construction Implementation.* The Contractor shall incorporate BMPs into the project as outlined in the accepted schedule.
- (e) *Stabilization.* The surface area of erodible earth material exposed at one time by clearing and grubbing, and earthwork operations shall not exceed 34 acres. Once earthwork has begun on a section, it shall be pursued until completion.

Clearing and grubbing operations shall be scheduled and performed so that grading operations and final stabilization measures can follow immediately thereafter if the project conditions permit. Otherwise temporary stabilization measures shall be taken between successive construction stages. Additional work required because the Contractor has failed to properly coordinate the entire erosion control schedule, thus causing previously seeded areas to be disturbed by operations that could have been performed prior to the seeding shall be performed at the Contractor's expense.

1. *Temporary Stabilization.* Temporary stabilization is defined as the covering of disturbed areas with seeding, mulching with a tackifier, surface roughening, soil binder, or a combination thereof. Other temporary soil stabilization techniques may be proposed, in writing, by the Contractor and used when approved in writing by the Engineer.

Disturbed areas where work is temporarily halted shall be temporarily stabilized immediately after the activity ceases for the day.

Temporary stabilization of areas where work is temporarily halted shall consist of one of the following:

- (1) Surface roughening.
- (2) Vertical tracking.
- (3) Placing 1.5 Tons of certified weed free forage hay or straw mulching per acre which shall be mechanically crimped into the soil in combination with an organic mulch tackifier.
- (4) Placing soil binder.
- (5) Placing cellulose fiber mulch with tackifier.
- (6) Placing a spray-on mulch blanket.
- (7) Using a combination from items (1) - (6), as approved.

Disturbed surfaces outside the pavement limits slope shall be left in a surface roughened or vertically tracked condition at the end of each shift.

Subgrade within the pavement limits that will remain uncovered by surfacing more than seven days shall be protected by an approved BMP.

Payment for temporary stabilization will be made at the contract unit price if the work is interrupted due to no fault or negligence of the Contractor. Payment will not be made for temporary stabilization required by Contractor's negligence, by the lack of proper Contractor scheduling or for the convenience of the Contractor.

2. Final Stabilization. Final stabilization is defined as the covering of disturbed areas with final seeding, mulching with tackifier, soil retention blankets, or a combination thereof as required by the Contract. Other final stabilization techniques may be proposed by the Contractor, in writing, and used when approved in writing by the Engineer.

Final stabilization shall begin within 48 hours after topsoil placement, soil conditioning, or combination thereof starts and shall be pursued to completion.

If approved by the Engineer, slopes from the edge of pavement to the point of slope selection may be left unseeded until paving has been completed. Unseeded slopes shall be temporarily stabilized as approved by Engineer.

3. Summer and winter stabilization. During the summer and winter when seeding is not allowed, temporary stabilization shall be placed. Temporary stabilization shall consist of one of the following:
 - (1) Surface roughening in combination with one of the items (3) thru (6).
 - (2) Vertical tracking in combination with one of the items (3) thru (6).
 - (3) Placing 1.5 Tons of certified weed free forage hay or straw mulching per acre which shall be mechanically crimped into the soil in combination with an organic mulch tackifier.
 - (4) Placing soil binder.
 - (5) Placing cellulose fiber mulch with tackifier.
 - (6) Placing a spray-on mulch blanket.

- (f) *Maintenance.* Erosion and sediment control practices and other protective measures identified in the SWMP as BMPs for stormwater pollution prevention shall be maintained in effective operating condition. BMPs shall be continuously maintained in accordance with good engineering, hydrologic and pollution control practices, including removal of collected sediment when silt depth is 50 percent or more of the height of the erosion control device. When possible, the Contractor shall use equipment with an operator rather than labor alone to remove the sediment.

Maintenance of erosion and sediment control devices shall include replacement of such devices upon the end of their useful service life as recommended by the ECS and approved by the Engineer. Maintenance of rock check dams and vehicle tracking pads shall be limited to removal and disposal of sediment or addition of aggregate.

Complete site assessment shall be performed as part of comprehensive inspection and maintenance procedures, to assess the adequacy of BMPs at the site and the necessity of changes to those BMPs to ensure continued effective performance. Where site assessment results in the determination that new or replacement BMPs are necessary, the BMPs shall be installed to ensure continuous effectiveness. When identified, BMPs shall be maintained, added, modified or replaced as soon as possible, immediately in most cases.

Approved new or replaced BMPs will be measured and paid for in accordance with subsections 208.11 and 208.12. Devices damaged due to the Contractor's negligence shall be replaced at Contractor's expense.

From the time seeding and mulching work begins until the date the project is accepted, the Contractor shall maintain all seeded areas. Damage to seeded areas or to mulch materials shall be immediately restored. Damage to seeded areas or to mulch materials due to Contractor negligence shall be immediately restored at the Contractor's expense. Restoration of other damaged areas will be measured and paid for under the appropriate bid item.

Temporary BMPs shall be removed upon completion of the project unless otherwise directed by the Engineer. If removed, the area in which these BMPs were constructed shall be returned to a condition similar to that which existed prior to its disturbance. Removed BMPs shall become the property of the Contractor.

If a project delay occurs, the Contractor shall be responsible to continue erosion and sediment control operations beyond the original contract time.

Sediment removed during maintenance of BMPs may be used in or on embankment, provided it meets conditions of Section 203, or it shall be wasted in accordance with subsection 107.25.

Whenever sediment collects on the paved surface, the surface shall be cleaned. Street washing will not be allowed. Storm drain inlet protection shall be in place prior to shoveling, sweeping, or vacuuming. Sweeping shall be completed with a pickup broom or equipment capable of collecting sediment. Sweeping with a kick broom will not be allowed.

Material from pavement saw cutting operations shall be cleaned from the roadway surface during operations using a vacuum. A BMP, such as a berm, shall be placed to contain slurry from joint flushing operations until the residue can be removed from the soil surface. Residue shall be removed and disposed of in accordance with subsection 107.25(b) 13. Erosion logs or other permeable BMPs shall not be used. Material containment and removal will not be paid for separately, but shall be included in the work.

208.05 Construction of BMPs. BMPs shall be constructed in accordance with the following.

- (a) *Seeding, Mulching, Sodding, Soil Retention Blanket.* Seeding, mulching, sodding, and soil retention blanket shall be performed in accordance with Sections 212, 213, and 216.
- (b) *Erosion Bales.* The bales shall be anchored securely to the ground with wood stakes.
- (c) *Silt Fence.* Silt fence shall be installed in locations specified in the Contract prior to any grubbing or grading activity.
- (d) *Temporary Berms.* Berms shall be constructed to the dimensions shown in the Contract, graded to drain to a designated outlet, and sufficiently compacted to prevent erosion or failure. If the berm erodes or fails, it shall be immediately repaired or replaced at the Contractor's expense.
- (e) *Temporary Diversion.* Diversions shall be constructed to the dimensions shown in the Contract, and graded to drain to a designated outlet. The berm shall be sufficiently compacted to prevent erosion or failure. If the diversion erodes or fails, it shall be immediately repaired or replaced at the Contractor's expense.
- (f) *Temporary Slope Drains.* Temporary slope drains shall be installed prior to installation of permanent facilities or growth of adequate ground cover on the slopes. All temporary slope drains shall be securely anchored to the slope. The inlets and outlets of temporary slope drains shall be protected to prevent erosion.
- (g) *Silt Berm.* Prior to installation of silt berms, the Contractor shall prepare the surface of the areas in which the berms are to be installed such that they are free of materials greater than 2 inches in diameter and are suitably smooth for the installation of the silt berms, as approved.

Silt berms shall be secured with spikes. A minimum one spike per foot shall be installed on both sides of each silt berm and in accordance with the manufacturer's recommendations. The Contractor shall install the silt berm in a manner that will prevent water from going around or under the silt berm. Silt berms shall be installed on top of soil retention blanket.

- (h) *Rock Check Dam.* Rock shall be installed at locations shown on the plans. Rock check dams shall conform to the dimensions shown on the plans.
- (i) *Rip rap Outlet Protection.* Geotextile used shall be protected from cutting or tearing. Overlaps between two pieces of geotextile shall be 1 foot minimum. Rip rap size shall be as shown on the plans.
- (j) *Storm Drain Inlet Protection.* Prior to installation, the Contractor shall sweep the surface of the area in which the storm drain inlet protection devices are to be installed such that the pavement is free of sediment and debris. The ends of the inlet protection shall extend a minimum of 1 foot past each end of the inlet.

The Contractor shall remove all accumulated sediment and debris from the surface surrounding the Type I and II inlet protection device after each rain event or as directed. The Contractor shall remove accumulated sediment from Type II containment area when it is more than one third full of sediment, or as directed.

The Contractor shall protect storm drain facilities adjacent to locations where pavement cutting operations involving wheel cutting, saw cutting, sand blasting, or abrasive water jet blasting are to take place.

- (k) *Sediment Trap.* Sediment traps shall be installed to collect sediment laden water and to minimize the potential of pollutants leaving the project site. Locations shall be as shown on the plans or as directed.

Sediment traps shall be constructed prior to disturbance of upslope areas and shall be placed in locations where runoff from disturbed area can be diverted into the trap.

The area under the embankment shall be cleared, grubbed and stripped of any vegetation and root pad.

Fill material for the embankment shall be free of roots or other vegetation, organic material, large stones, and other objectionable material.

Sediment shall be removed from the trap when it has accumulated to one half of the wet storage depth of the trap and shall be disposed of in accordance with subsection 208.04(f).

- (l) *Erosion Logs.* Erosion logs shall be embedded 2 inches into the soil. Stakes shall be embedded to a minimum depth of 12 inches. At the discretion of the Engineer, a shallower depth may be permitted if rock is encountered.

The Contractor shall maintain the erosion logs during construction to prevent sediment from passing over or under the logs.

- (m) *Silt Dikes.* Prior to installation of silt dikes, the Contractor shall prepare the surface of the areas in which the silt dikes are to be installed such that they are free of materials greater than two inches in diameter and are suitably smooth for the installation of the silt dikes, as approved by the Engineer.

- (n) *Concrete Washout Structure Design.* The concrete washout structure shall meet or exceed the dimensions shown on the plans or be used in accordance with manufacturer's recommendations. Work on this structure shall not begin until written acceptance is provided by the Engineer.

Earthen in ground concrete washout structures shall meet the following requirements:

- (1) Structure shall contain all washout water.
- (2) Stormwater shall not carry wastes from washout and disposal locations.

- (3) The site shall be located a minimum of 50 horizontal feet from state waters and shall meet all requirements for containment and disposal as defined in subsection 107.25.
- (4) The site shall be signed as "Concrete Washout".
- (5) The site shall be accessible to appropriate vehicles.
- (6) The bottom of excavation shall be a minimum of five feet vertical above groundwater or, alternatively, excavation must be lined with an impermeable synthetic liner that is designed to control seepage to a maximum rate of 10^{-6} centimeters per second.
- (7) Freeboard capacity shall be included into structure design to reasonably ensure the structure will not overtop during or because of a precipitation event.
- (8) The Contractor shall prevent tracking of washout material out of the washout structure.
- (9) Solvents, flocculents, and acid shall not be added to wash water.
- (10) The use of an in ground concrete washout site shall be less than one year.
- (11) The structure shall be fenced with orange plastic construction fencing to provide a barrier to construction equipment and to aid in identification of the concrete washout area.
- (12) Concrete waste, liquid and solid, shall not exceed $2/3$ the storage capacity of the washout structure.

Fabricated concrete washout structures shall meet the following requirements.

- (1) Structure shall contain all washout water.
- (2) The site shall be located a minimum of 50 horizontal feet from state waters and shall meet all requirements for containment and disposal as defined in subsection 107.25.
- (3) The site shall be delineated with orange plastic fence or other means and signed as "Concrete Washout".
- (4) The site shall be accessible to appropriate vehicles.
- (5) Freeboard capacity shall be included into structure design to reasonably ensure the structure will not overtop during or because of a precipitation event.
- (6) Solvents, flocculants, and acid shall not be added to wash water.
- (7) Concrete waste, liquid and solid, shall not exceed $2/3$ the storage capacity of the washout structure.

The concrete washout structure shall be completed and ready for use prior to concrete placement operations.

Washout areas shall be checked by the ECS and maintained as required. On site permanent disposal of concrete washout waste is not allowed.

All liquid and solid wastes, including contaminated sediment and soils generated from concrete washout shall be hauled away from the site and disposed of properly at the Contractor's expense.

- (o) *Vehicle Tracking Pad.* Vehicle tracking pads shall be constructed to the minimum dimensions shown in the Contract, unless otherwise directed by the Engineer. Construction of approved vehicle tracking pads shall be completed before any excavation or work begins.

The Contractor shall maintain each vehicle tracking pad during the entire time that it is in use for the project. The vehicle tracking pad shall be removed at the completion of the project unless otherwise directed by the Engineer.

- (p) *Detention Pond.* Permanent detention ponds shown on the construction plans may be used as temporary BMPs if all the following conditions are met:

- (1) The pond is designated as a construction BMP in the SWMP.
- (2) The pond outfall and outlet are designed and implemented for use as a BMP during construction in accordance with good engineering, hydrologic, and pollution control practices. The stormwater discharges from the outfall shall not cause degradation or pollution of state waters, and shall have BMPs, as appropriate.
- (3) All silt shall be removed and the pond returned to the design grade and contour prior to project acceptance.

- (q) *Gravel Bag.* Gravel bags shall be placed on a stable surface, consisting of pavement, grass or aggregate. Gravel bags shall be placed to conform to the surface without gaps. Discharge water shall not cause erosion.

- (r) *Surface roughening.* Surface roughening creates grooves along the contour of the slope. Roughening may be accomplished by furrowing, scarifying, ripping or disking the soil surface to create a 2 to 4 inch minimum variation in soil surface. Sands or soils that are primarily rock need not be roughened. Surface roughening will not be paid for separately, but shall be included in the work.

- (s) *Vertical Tracking.* Vertical tracking involves driving a tracked vehicle up and down the soil surface and creating horizontal grooves and ridges. Sands or soils that are primarily rock need not be tracked. Vertical tracking will not be paid for separately, but shall be included in the work.

208.06 Materials Handling and Spill Prevention. The ECS shall clearly describe and record on the SWMP, all practices implemented at the site to minimize impacts from procedures or significant material that could contribute pollutants to runoff. Areas or procedures where potential spills can occur shall have spill contingency plans in place as specified in subsections 107.25(b)6 or 208.06(c).

- (a) Bulk storage structures for petroleum products and other chemicals shall have impervious secondary containment or equivalent adequate protection so as to contain all spills and prevent any spilled material from entering state waters. Secondary containment shall be capable of containing the volume of the storage structures plus at least 10 percent freeboard. If secondary containment is used and results in accumulation of stormwater within the containment, a plan shall be implemented to properly manage and dispose of accumulated stormwater.
- (b) The Contractor shall inspect equipment, vehicles, and repair areas daily to ensure petroleum, oils, and lubricants (POL) are not leaking onto the soil or pavement. Absorbent material or containers approved by the Engineer shall be used to prevent leaking POL from reaching the soil or pavement. The Contractor shall have onsite approved absorbent material or containers of sufficient capacity to contain any POL leak that can reasonably be foreseen. All materials resulting from POL leakage control and cleanup shall become the property of the Contractor and shall be removed from the site. Control, cleanup, and removal of by-products resulting from POL leaks shall be performed at the Contractor's expense.
- (c) Spill Prevention, Control, and Countermeasure Plan shall be developed and implemented to establish operating procedures for handling potential pollutants and preventing spills.

The Spill Prevention, Control, and Countermeasure Plan shall contain the following information:

- (1) Identification and contact information of the ECS and the Contractor and CDOT spill cleanup coordinators.
- (2) Locations of areas on project site where equipment fueling and servicing operations are permitted.
- (3) Location of cleanup kits.
- (4) Quantities of chemicals and locations stored on site.
- (5) Label system for chemicals and Materials Safety Data Sheets (MSDS) for products.
- (6) Clean up procedures to be implemented in the event of a spill that does not enter state waters or ground water.
- (7) Procedures for spills of any size that enter surface waters or ground water, or have the potential to do so. CDOT's Erosion Control and Stormwater Quality Guide (current edition) contains Spill notification contacts and phone numbers required in the SPCC.
- (8) A summary of the employee training provided.
- (9) Information in items (1) through (8) shall be updated when it changes.

208.07 Stockpile Management. Material stockpiles shall be located away from sensitive areas and shall be confined so that no potential pollutants will enter state waters or conveyances to state waters (e.g., ditches). Locations shall be approved by the Engineer.

Erodible stockpiles (including topsoil) shall be contained with acceptable BMPs at the toe (or within 20 feet of the toe) throughout construction. BMPs shall be approved by the Engineer. The ECS shall describe, detail, and record the sediment control devices on the SWMP.

208.08 Limits of Disturbance. The Contractor shall limit construction activities to those areas within the limits of disturbance shown on the plans and cross-sections. Construction activities, in addition to the Contract work, shall include the on-site parking of vehicles or equipment, on-site staging, on-site batch plants, haul roads or work access, and all other action which would disturb existing conditions. Off road staging areas must be pre-approved by the Engineer, unless otherwise designated in the Contract. Construction activities beyond the limits of disturbance due to Contractor negligence shall be restored to the original condition by the Contractor at the Contractor's expense. The ECS shall tabulate additional disturbances not identified in the SWMP and indicate locations and quantities on the SWMP and report to the Engineer.

The Contractor shall pursue and stabilize all disturbances to completion.

208.09 Failure to Perform Erosion Control. Failure to implement the Stormwater Management Plan is a violation of the CDPS - SCP and CDOT specifications. Penalties may be assessed to the Contractor by the appropriate agencies. All fines assessed to the Department for the Contractor's failure to implement the SWMP will be deducted from moneys due the Contractor in accordance with subsection 107.25(c) 2.

The Contractor will be subject to liquidated damages for incidents of failure to perform erosion control as required by the Contract. Liquidated damages will be applied for failure to comply with the CDPS-SCP and these specifications, including, but not limited to the following:

- (1) Failure to include erosion control in the project schedule or failure to include erosion control in each schedule update as specified in subsection 208.03(b).
- (2) Failure of the Erosion Control Supervisor to perform the inspections required by subsection 208.03(c)4.
- (3) Failure of the ECS to implement necessary actions required by the Engineer as required by subsection 208.03(c).
- (4) Failure to amend SWMP and implement BMPs as required by subsection 208.04.
- (5) Failure to keep documentation and records current.

- (6) Failure to construct or implement erosion control or spill containment measures required by the Contract, or failure to construct or implement them in accordance with the Contractor's approved schedule as required by subsection 208.06(c).
- (7) Failure to limit the exposed surface area of erodible earth to 34 or fewer acres as required by subsection 208.04(e).
- (8) Failure to stabilize disturbed areas as required by subsections 208.04(e) and 208.08.
- (9) Failure to replace or perform maintenance on an erosion control feature after notice from the Engineer to replace or perform maintenance as required by subsection 208.04(f).
- (10) Failure to remove and dispose of sediment from BMPs as required.
- (11) Failure to install and properly utilize a concrete washout structure for containing washout from concrete placement operations.
- (12) Failure to perform permanent stabilization as required by subsection 208.04 (e).
- (13) Failure of the Superintendent or ECS to perform inspections as required by subsection 208.03(c)(5) and record findings in the Daily Stormwater Log.
- (14) Failure of the Superintendent or ECS to attend 14 day inspections.

The Engineer will immediately notify the Contractor in writing of each incident of failure to perform erosion control in accordance with the CDPS-SCP, including, but not limited to items (1) through (14) above. Correction shall be made as soon as possible but no later than 48 hrs from the date of notification to correct the failure. The Contractor will be charged liquidated damages in the amount of \$875 for each calendar day after the 48 hour period has expired, that one or more of the incidents of failure to perform the requirements of CDPS-SCP, including, but not limited to items (1) through (14) above, remains uncorrected.

This deduction will not be considered a penalty, but will be considered liquidated damages based on estimated additional construction engineering costs. The liquidated damages will accumulate, for each cumulative day that one or more of the incidents remains uncorrected. The number of days for which liquidated damages are assessed will be cumulative for the duration of the project; that is: the damages for a particular day will be added to the total number of days for which liquidated damages are accumulated on the project. The liquidated damages will be deducted from any monies due the Contractor.

When a failure meets any one of the following conditions, the Engineer may immediately issue a Stop Work Order in accordance with subsection 105.01 irrespective of any other available remedy:

- (1) It may endanger health or the environment.
- (2) It consists of a spill or discharge of hazardous substances or oil which may cause pollution of the waters of the state.

- (3) It consists of a discharge of stormwater which may cause an exceedance of a water quality standard.

If all other failures are not corrected within 48 hours after liquidated damages have begun to be assessed, the Engineer may issue a Stop Work Order in accordance with subsection 105.01. Work shall not resume until the Engineer has approved a written corrective action plan submitted by the Contractor that includes measures to prevent future violations and a schedule for implementation.

Disagreements regarding the suggested corrective action for a BMP compliance issue between the Project Engineer, ECS, and Superintendent, shall be discussed with the Resident Engineer and Region Water Pollution Control Manager. If after meeting with the ECS, Resident Engineer and Region Water Pollution Control Manager, the Contractor is still in disagreement and feels that additional compensation is owed, the Contractor will follow the decision of the Project Engineer, keep track of the costs and negotiate further with the Project Engineer. If after pursuing the issue, the Contractor is unable to reach agreement with the Project Engineer, then the Contractor can follow the dispute process outlined in subsection 105.22.

If the Contractor's corrective action plan and schedule are not submitted and approved within 48 hours of the Stop Work Order or the corrective action plan is not implemented by the Contractor, the Engineer will have an on-site meeting with the Superintendent and the Superintendent's supervisor. This meeting will also be attended by the Resident Engineer, the Region Water Pollution Control Manager, and the Region Program Engineer. This meeting will identify and document needed corrective actions and a schedule for completion. If after the meeting, the unacceptable work is not remedied within the schedule as agreed to in the meeting, the Engineer will take action to effect compliance with the CDPS-SCP by utilizing CDOT Maintenance personnel or other non-Contractor forces and deduct the cost from any moneys due or to become due to the Contractor pursuant to subsection 105.17. Delays due to these Stop Work Orders shall be considered nonexcusable. The Stop work Order shall be in place until the project is in CDPS-SCP compliance.

If the Contractor remains non-responsive to requirements of the on-site meeting, the Engineer will start default or Contract termination procedures in accordance with subsections 108.10 and 108.11. CDOT will proceed with corrective or disciplinary action in accordance with the *Rules for Prequalification, Debarment, Bidding and Work on Transportation, Road, Highway and Bridge Public Projects*.

208.10 Items to Be Accomplished Prior to Final Acceptance.

- (a) *Reclamation of Washout Areas.* After concrete operations are complete, washout areas shall be reclaimed in accordance with subsection 208.05(n) at the Contractor's expense.
- (b) *Survey.* The Contractor shall survey Permanent Water Quality BMPs (Permanent BMPs) on the project after they are constructed and confirm they are at final configuration and grade. The Engineer will identify which Permanent BMPs shall be surveyed prior to the final walk through. The survey shall be performed in accordance with Section 625.

- (c) *Project Walk Through.* Prior to final acceptance, a final walk through of the project shall occur with the Superintendent, the ECS, the Engineer, the Region Water Pollution Control Manager, and CDOT Maintenance personnel; and the CDOT Landscape Architect, CDOT Region Environmental personnel, and the CDOT Hydraulics Engineer as determined by the Engineer in attendance. At this time final stabilization shall be reviewed and BMPs shall be inspected for needed cleaning, maintenance, or removal. Areas will be inspected for any additional BMPs that may be required. Permanent BMPs shown on the plans shall be inspected to confirm that as constructed location, condition, and other plan requirements have been met. Any required work will be listed by the Project Engineer and shall be performed in accordance with subsection 105.21.
- (d) *Removal of Temporary BMPs.* Temporary BMPs subject to removal shall be determined at the final walk through of the project and removed by the Contractor.
- (e) Upon completion of work required by walk through the ECS shall modify the SWMP to provide an accurate depiction of what remains on the project site.

METHOD OF MEASUREMENT

208.11 Erosion bales and will be measured by the actual number installed and accepted.

Silt fence, silt berms, erosion logs, gravel bags, silt dikes, temporary berms, rock check dams, temporary diversions, and temporary slope drains, will be measured by the actual number of linear feet that are installed and accepted.

Concrete washout structure will be measured by the actual number of structures that are installed and accepted.

Storm drain inlet protection will be measured by the linear foot of storm drain inlet protection device installed and accepted.

Sediment trap quantities will be measured by the actual number installed and accepted.

Removal of trash that is not generated by construction activities will be measured by the actual number of hours that Contractor workers actively remove trash from the project. Each week the Contractor shall submit to the Engineer a list of workers and the hours spent collecting such trash.

Erosion Control Supervisor will be measured by one of the following two methods; the method will be shown on the bid schedule:

- (1) The total number of hours the ECS is required to be on the project performing the duties outlined in subsection 208.03(c) specific to this project. The Contractor shall record the tasks that were performed by the Erosion Control Supervisor and the hours that were required to complete each task. The records shall be submitted to the Engineer weekly, after completion of the work, for approval and acceptance.

- (2) The total number of authorized 24 hour days used for erosion control services specific to this project. An authorized 24 hour day of ECS will be every calendar day that the ECS is required to be on the project performing the duties outlined in subsection 208.03(c). The Contractor shall record the tasks that were performed by the Erosion Control Supervisor. The records shall be submitted to the Engineer, weekly, after completion of the work, for approval and acceptance.

Excavation required for removal of accumulated sediment from traps, basins, areas adjacent to silt fences and erosion bales, and other clean out excavation of accumulated sediment, and the disposal of such sediment, will be measured by the number of hours that equipment, labor, or both are used for sediment removal.

Vehicle tracking pads will be measured by the actual number constructed and accepted.

BASIS OF PAYMENT

208.12 Erosion Control Supervisor and BMPs will be paid for at the Contract unit price for each of the items listed below that appear in the bid schedule.

Payment will be made under:

Pay Item	Pay Unit
Concrete Washout Structure	Each
Erosion Bales (Weed Free)	Each
Erosion Control Supervisor	Day
Erosion Control Supervisor	Hour
Erosion Log (____ Inch)	Linear Foot
Gravel Bag	Linear Foot
Removal and Disposal of Sediment (Equipment)	Hour
Removal and Disposal of Sediment (Labor)	Hour
Removal of Trash	Hour
Rock Check Dam	Each
Sediment Trap	Each
Silt Berm	Linear Foot
Silt Dike	Linear Foot
Silt Fence	Linear Foot
Storm Drain Inlet Protection (Type__)	Linear Foot
Sweeping (Sediment Removal)	Hour
Temporary Berm	Linear Foot
Temporary Diversion	Linear Foot
Temporary Slope Drains	Linear Foot
Vehicle Tracking Pad	Each

Temporary erosion control will be measured and paid for by the BMPs used, except that surface roughening and vertical tracking will not be measured and paid for separately.

Payment for each BMP item will be full compensation for all work and materials required to furnish, install, maintain, remove, and dispose of it.

Payment for concrete washout structure, whether constructed or prefabricated, will be full compensation for all work and materials required to install, maintain, and remove the item. This includes, but is not limited to: excavation, embankment, liner, erosion bales, fencing, signing, and containment and disposal of concrete washout and all other associated waste material.

Payment for *Erosion Control Supervisor* will be full compensation for the erosion control supervisor and all materials and equipment necessary for the ECS to perform the work. The ECS's commute time will not be measured and paid for separately, but shall be included in the work.

Payment for *Removal and Disposal of Sediment (Equipment)* will be full compensation for use of the equipment, including the operator.

Silt berm spikes will not be measured and paid for separately, but shall be included in the work. When required, soil retention blankets will be measured and paid for in accordance with Section 216.

Silt dike staples will not be measured and paid for separately, but shall be included in the work.

Spray-on mulch blankets required by the Contract will be measured and paid for in accordance with Section 213.

Payment for storm drain inlet protection will be full compensation for all work, materials, and equipment required to complete the item, including surface preparation, maintenance throughout the project, and removal upon completion of the work. Aggregate will not be measured and paid for separately, but shall be included in the work.

Sweeping, when used as a BMP as shown in the Contract, will be measured by the number of hours that a pickup broom or equipment capable of collecting sediment, authorized by the Engineer, is used to remove sediment from the roadway or other paved surfaces. Each week the Contractor shall submit to the Engineer a statement detailing the type of sweeping equipment used and the number of hours it was used to pick up sediment. Operator will not be measured and paid for separately, but shall be included in the work.

Stakes, anchors, connections, geotextile, riprap and tie downs used for temporary slope drains will not be measured and paid for separately, but shall be included in the work.

Payment for vehicle tracking pad will be full compensation for all work, materials and equipment required to construct, maintain, and remove the entrance upon completion

of the work. Aggregate and geotextile will not be measured and paid for separately, but shall be included in the work. Replacement aggregate for vehicle tracking pads will be measured and paid for by the ton in accordance with Section 304.

Seeding, sod, mulching, soil retention blanket, and riprap will be measured and paid for in accordance with Sections 212, 213, 216, and 506.

Surveying of permanent BMPS will not be measured and paid for separately, but shall be included in the Section 625 pay item, Surveying.

Payment will be made for BMPs replaced as approved by the Engineer.

Work performed to install measures for the control of erosion and sedimentation, and water pollution, for which there is no bid item originally included in the Contract will be considered extra work in accordance with subsection 104.03.

Temporary erosion and pollution control measures required due to the Contractor's negligence, carelessness, or failure to install permanent controls as a part of the work as scheduled or ordered by the Engineer or for the Contractor's convenience, shall be performed at the Contractor's expense.

If the Contractor fails to complete construction within the approved contract time, payment will not be made for Section 208 pay items for the period of time after expiration of the approved contract time. These items shall be provided at the Contractor's expense.

SECTION 210 RESET STRUCTURES

DESCRIPTION

210.01 This work consists of removing, relaying, resetting, or adjusting structures and related materials. All designated items shall be carefully removed, and stored, reinstalled, or adjusted, in a manner that will avoid loss or damage.

CONSTRUCTION REQUIREMENTS

210.02 General. Relaid pipe and conduit, and reset structures shall be cleaned of foreign material prior to reinstallation.

Except in areas to be excavated, all holes resulting from the removal of structures shall be neatly backfilled. Methods shall conform to those required in the specifications for the various types of construction involved.

Materials in good condition from removed structures may be re-used. Salvable material, as designated in the Contract, that is not re-used shall remain the property of the Department, and the Contractor shall be held responsible for safekeeping of all materials until received by the Department. Materials damaged, stolen, or lost prior to receipt by the Department shall be repaired or replaced, as determined by the Engineer, at no cost to the Department.

Unserviceable material, as determined by the Engineer, shall be replaced with new material of similar dimensions, and the material costs will be paid for in accordance with subsection 109.04(b), except as otherwise provided in this section. All new materials and replacement parts shall conform to the requirements of the Contract for the appropriate items.

210.03 Light Standard. Light standards shall be reset on new concrete foundation pads complete with conduit and wiring in accordance with the Department's Standard Plans at locations indicated in the Contract.

210.04 Fences and Gates. Where fences (except snow fence) are reset the Contractor shall supply and install any new materials required to restore the fence to acceptable condition except for new posts. The Contractor shall supply new posts as needed for the reset fence in accordance with Section 607. Wire in the old fence shall be salvaged and used in the reset fence.

Where snow fences are reset, panels shall be removed from their existing location and reset at the new location.

Gates designated to be reset shall be removed and restored for service at the new locations.

Right of way fence shall be reset approximately 6 inches inside the boundary of the highway right of way shown on the plans. Anchorages, footings, or fence

appurtenances shall not extend beyond the limits of the highway right of way without the written consent of the abutting property owner.

210.05 Guardrail. Where guardrail is reset the Contractor shall supply and install any new materials needed to restore the guardrail to acceptable condition. New materials shall include additional posts, blocks, and hardware needed to complete the intermediate post installations as shown on the Department's Standard Plans. Posts with similar tops shall be installed in groups as directed. Installation of fiat-top posts alternately with other top shapes will not be permitted. Posts may be cut, rotated, or turned upside down to eliminate unacceptable tops. If the posts are cut, the Contractor shall treat the exposed surface with two coats of an approved preservative.

Adjust guardrail shall be the work necessary to adjust the height to the standard 27 inches in accordance with Standard Plan M-606-1, and filling the resulting voids under the posts with a lean concrete mixture consisting of one part cement and ten parts sand.

210.06 Mailbox. Mailboxes complete with supporting structures are to be removed and temporarily reset at points near their original location to be accessible for mail delivery service. Upon completion of surfacing operations, the boxes shall again be reset at the locations designated. A supporting structure may contain one or more mailboxes. New permanent mailbox support posts and mounting brackets shall be furnished and installed in accordance with the Department's Standard Plans.

210.07 Ground Sign. Signs and posts designated to be reset shall be removed, cleaned, and reset at designated locations, including all work necessary to provide the existing posts with break-away devices, where required.

210.08 Sign Structure. Sign structures shall be sandblasted and repainted prior to reinstallation.

210.09 Traffic Signal. Traffic signals designated to be reset shall be removed along with existing poles and electrical equipment. New concrete footings shall be installed along with any new electrical equipment necessary to restore the structure to service at the new location. Equipment and materials shall be cleaned prior to being reset.

210.10 Adjust Structure. Adjusting structures shall apply, but not be limited to, manhole rings and covers, inlet gratings and frames, water valve boxes, water meters, gate posts, and other structures and facilities. Construction operations shall consist of raising, lowering, moving, or removing masonry or concrete; adding brick-work, masonry, or concrete; and resetting grates, frames, or rings and covers to fit the new construction. Structures in the traveled roadway shall be adjusted to a tolerance of $\frac{1}{4}$ to $\frac{1}{2}$ inch below the surface of the roadway. Work on water services shall be subject to inspection and testing by the owners. Damage to any fire hydrant or any part of the water system by the Contractor shall be repaired at the Contractor's expense.

210.11 Flashing Beacon. Reset Flashing Beacon shall consist of providing a new concrete foundation or footing, adjustments of post and breakaway device as required, and providing all electrical equipment and materials necessary to restore the installation to service at the new location. The Contractor shall provide necessary connections from the nearest power source or from the source designated on the plans to the new location.

METHOD OF MEASUREMENT

210.12 The quantity to be measured where items are reset or adjusted on an “each” basis shall be the actual number of those items restored for service at new location, completed and accepted.

Concrete foundation pads will be measured and paid for as “Concrete Foundation Pad” in accordance with Section 613.

Concrete footings for ground signs and overhead sign structures, if required, will be measured and paid for in accordance with Section 614.

Steel post extensions, if required, will be measured and paid for as “Steel Sign Post” in accordance with Section 614, of the type shown on the plans.

The quantity to be measured where items are reset or adjusted on a “linear foot” basis shall be the actual number of linear feet of the items completed and accepted, measured end to end, except guardrail and snow fence. Guardrail will be measured as the actual number of linear feet completed and accepted, as shown on the Department’s Standard Plans. Snow fence shall be measured end to end of the anchor posts.

The quantity to be measured for “Relay Pipe” shall be the number of linear feet of re-laid pipe including end sections, measured end to end, in place, completed and accepted.

The quantity to be measured for “Reset Mailbox Structure” shall be the number of supporting structures, complete with mailboxes, restored at new locations and accepted. Moving the mailbox structures for temporary mail service during construction, and installing new support post, base, mounting brackets, and hardware will not be measured or paid for separately but shall be included in the work.

Resetting of structures, fences, and related materials shall include all work necessary to remove the items from their existing location to the new location, and shall include all mounting hardware, footings, and all other work necessary to complete the reset item, except for new fence posts. Fence posts required and approved will be measured and paid for in accordance with Section 607.

Resetting of traffic signals, poles, controllers, cabinets, preemption units, coordination and interconnection equipment, and related equipment and materials shall include all work necessary to remove the items from their existing location and reset them at the new location, and shall include all mounting hardware,

footings, other electrical equipment and service, and all other materials and work necessary to complete the reset item in service at the new location.

BASIS OF PAYMENT

210.13 The accepted quantities, measured as provided above, will be paid for at the contract price for each of the pay items listed below that appear in the bid schedule.

Payment will be made under:

Pay Item	Pay Unit
Reset_____	Each, Linear Foot, Square Yard, Lump Sum
Relay Pipe (___)	Linear Foot
Adjust_____	Each, Linear Foot
Modify_____	Each
Reset Mailbox Structure (Type___)	Each
Adjust Guardrail	Linear Foot

Structure excavation and structure backfill required for “Relay Pipe” will be measured and paid for in accordance with Section 206. Any void in the structure excavation prism created by the removal of pipe will be excluded from measurement and payment of structure excavation.

Except as otherwise provided in the Contract, collars and connecting devices will not be measured and paid for separately but shall be included in the work.

SECTION 212
SEEDING, FERTILIZER, SOIL CONDITIONER, AND
SODDING

DESCRIPTION

212.01 This work consists of soil preparation, application of fertilizer, soil conditioners, or both, and furnishing and placing seed and sod. The work shall be in accordance with the Contract and accepted horticultural practices.

MATERIALS

212.02 Seed, Soil Conditioners, Fertilizers, and Sod.

- (a) *Seed.* All seed shall be furnished in bags or containers clearly labeled to show the name and address of the supplier, the seed name, the lot number, net weight, origin, the percent of weed seed content, the guaranteed percentage of purity and germination, pounds of pure live seed (PLS) of each seed species, and the total pounds of PLS in the container. All seeds shall be free from noxious weed seeds in accordance with current state and local lists and as indicated in Section 213. The Contractor shall furnish to the Engineer a signed statement certifying that the seed is from a lot that has been tested by a recognized laboratory for seed testing within six months prior to the date of seeding. Seed which has become wet, moldy, or damaged in transit or in storage will not be accepted.

Seed types and amount of PLS required per acre shall be provided in accordance with the Contract.

Seed and seed labels shall conform to all current State and Federal regulations and will be subject to the testing provisions of the Association of Official Seed Analysis. Computations for quantity of seed required on the project shall include the percent of purity and percent of germination.

The formula used for determining the quantity of PLS shall be:

Bulk Pounds of Seed Species • (%Purity • %Germination) = Pounds of PLS

- (b) *Soil Conditioners and Fertilizer.*
1. Fertilizer: Fertilizer (plant nutrients) shall conform to the applicable State fertilizer laws. It shall be uniform in composition, dry, and free flowing, and shall be delivered to the site in the original, unopened containers, each bearing the manufacturer's guaranteed analysis. Fertilizer which becomes caked or damaged will not be accepted.
 2. Soil Conditioner: Soil conditioner shall consist of compost, biological nutrient, biological culture, or humic acid based material.

Humic acid based material (Humate) shall include the following:

- (1) pH 3 to 5
- (2) Maximum 20 percent inert ingredient
- (3) Minimum 80 percent organic matter with 40 percent minimum humic acid.

Compost shall be weed-free, organic compost derived from a variety of feed stocks including agricultural, biosolids, forestry, food, leaf and yard trimmings, manure, tree wood with no substances toxic to plants. Material shall be aerobically composted in a facility permitted by the Colorado Department of Public Health and Environment (CDPHE) to produce or sell compost in accordance with House Bill (HB) 1181. The Contractor shall submit a copy of this permit to the Engineer for approval and the project records. The compost shall be tested in accordance with the U.S. Composting Council's Test Methods for Examining of Composting and Compost (TMECC) manual.

The compost manufacturer shall be a participating member of in the U.S. Composting Council's Seal of Testing Assurance Program (STA). The Contractor shall provide a participation certificate and test data on a Compost Technical Data Sheet.

Compost shall have the following physical properties:

Compost Parameters	Reported as	Requirements	Test Method
pH	pH units	6.0 - 8.5	TMECC 04.11-A
Soluble Salts (Electrical Conductivity)	dS m ⁻¹ or mmhos cm ⁻¹	Maximum 10dS/m	TMECC 04.10-A
Moisture Content	%, wet weight basis	30 - 60%	TMECC 03.09-A
Organic Matter Content	%, dry weight basis	30 - 65%	TMECC 05.07-A
Particle Size (Sieve Sizes)	%, dry weight basis for each sieve fraction	<u>Passing</u> 1 inch - 100% ½ inch - 95%	TMECC 02.02-B
Man-made Inert Contamination	%, dry weight basis	< 1%	TMECC 03.08-A
Stability (Respirometry)	mg CO ₂ -C per g TS per day mg CO ₂ -C per g OM per day	8 or below	TMECC 05.08-B
Select Pathogens	(PASS/FAIL) Limits: Salmonella <3 MPN/4grams of TS, or Coliform Bacteria <1000 MPN/gram	Pass	TMECC 07.01-B Fecal Coliforms, or 07.02 Salmonella

Compost Parameters (cont.)	Reported as (cont.)	Requirements (cont.)	Test Method (cont.)
Trace Metals	(PASS/FAIL) Limits (mg kg ⁻¹ dw basis): As 41, Cd 39, Cu 1500, Pb 300, Hg 17, Ni 420, Se 100, Zn 2800	Pass	TMECC 04.06
Maturity (Bioassay)			
Percent Emergence	%, (average)	> 80%	TMECC 05.05-A
Relative Seedling Vigor	%, (average)	> 80%	
The Contractor shall provide a CTR in accordance with subsection 106.13 confirming that the material has been tested in accordance with TMECC.			

- (c) *Sod.* Sod shall be nursery grown and 99 percent weed free. Species shall be as shown on the plans. Other sod types may be used only if approved in writing by the Engineer. The one percent allowable weeds shall not include any undesirable perennial or annual grasses or plants defined as noxious by current State statute. Soil thickness of sod cuts shall not be less than $\frac{3}{4}$ inch nor more than 1 inch. Sod shall be cut in uniform strips with minimum dimensions of 18 inches in width and 48 inches in length. The Contractor shall submit a sample of the sod proposed for use, which shall serve as a standard. Any sod furnished, whether in place or not, that is not up to the standard of the sample may be rejected. Sod that was cut more than 24 hours prior to installation shall not be used.

Each load of sod shall be accompanied by a certificate from the grower stating the type of sod and the date and time of cutting.

CONSTRUCTION REQUIREMENTS

212.03 Seeding Seasons. Seeding in areas that are not irrigated shall be restricted according to the following time table and specifications.

Zone	Spring Seeding	Fall Seeding
Areas other than the Western Slope		
Below 6000'	Spring thaw to June 1	September 15 until consistent ground freeze
6000' to 7000'	Spring thaw to June 1	September 1 until consistent ground freeze
Zone (cont.)	Spring Seeding (cont.)	Fall Seeding (cont.)
7000' to 8000'	Spring thaw to July 15	August 1 until consistent ground freeze
Above 8000'	Spring thaw to consistent ground freeze	
Western Slope		
Below 6000'	Spring thaw to May 1	August 1 until consistent ground freeze
6000' to 7000'	Spring thaw to June 1	September 1 until consistent ground freeze
Above 7000'	Spring thaw to consistent ground freeze	

- (1) "Spring thaw" shall be defined as the earliest date in a new calendar year in which seed can be buried ½ inch into the surface soil (topsoil) thru normal drill seeding methods.
- (2) "Consistent ground freeze" shall be defined as that time during the fall months in which the surface soil (topsoil), due to freeze conditions, prevents burying the seed ½ inch thru normal drill seeding operations. Seed shall not be sown, drilled, or planted when the surface soil or topsoil is in a frozen or crusted state.

Seeding accomplished outside the time periods listed above will be allowed only when ordered by the Engineer or when the Contractor's request is approved in writing. When requested by the Contractor, the Contractor must agree to perform the following work at no cost to the Department: reseed, remulch, and repair areas which fail to produce species indicated in the Contract.

When seeding is ordered by the Engineer outside the time periods listed above, the cost of additional material will be paid for by the Department. The Contractor will not be responsible for failure of the seeded area to produce species indicated in the Contract due to reasons beyond the control of the Contractor.

The seeding, the soil conditioning, and the fertilizing application rate shall be as specified. The Engineer may establish test sections for adjusting the seeding and the fertilizing equipment to assure the specified rate. The Engineer may order equipment readjustment at any time.

Seed, soil conditioner and fertilizer shall not be applied during inclement weather including rain and high winds, or when soil is frozen or soil moisture is too high to evenly incorporate seed, soil conditioner or fertilizer.

212.04 Lawn Grass Seeding. Lawn grass seeding shall be accomplished in the seeding seasons described in subsection 212.03.

- (a) *Soil Preparation.* Preparatory to seeding lawn grass, irregularities in the ground surface, except the saucers for trees and shrubs, shall be removed. Measures shall be taken to prevent the formation of low places and pockets where water will stand.

Immediately prior to seeding, the ground surface shall be tilled or hand worked into an even and loose seedbed to a depth of 4 inches, free of clods, sticks, stones, debris, concrete, and asphalt in excess of 2 inches in any dimension, and brought to the desired line and grade.

- (b) *Fertilizing and Soil Conditioning.* The first application of fertilizer, soil conditioner, or both shall be incorporated into the soil prior to seeding, and shall consist of a soil conditioner, commercial fertilizer, or both as designated in the Contract. Fertilizer called for on the plans shall be worked into the top 4 inches of soil at the rate specified in the contract. Biological nutrient, culture or humic acid based material called for on the plans shall be applied in a uniform application onto the soil surface. Organic amendments shall be applied uniformly over the soil surface and incorporated into the top 6 inches of soil.

The second application of fertilizer shall consist of a fertilizer having an available nutrient analysis of 20-10-5 applied at the rate of 100 lbs. per acre. It shall be uniformly broadcast over the seeded area three weeks after germination or emergence. The area shall then be thoroughly soaked with water to a depth of 1 inch.

Fertilizer shall not be applied when the application will damage the new lawn.

- (c) *Seeding.* After the surface is raked and rolled, the seed shall be drilled or broadcast and raked into the top ¼ inch of soil. Seeding shall be accomplished by mechanical landscape type drills. Broadcast type seeders or hydraulic seeding will be permitted only on small areas not accessible to drills. Seed shall not be drilled or broadcast during windy weather or when the ground is frozen or untillable. All loose exposed rock larger than 2 inches shall be removed from slopes that are to be seeded by drilling.

Hydraulic seeding equipment shall include a pump capable of being operated at 100 gallons per minute and at 100 pounds per square inch pressure, unless otherwise directed. The equipment shall have a nozzle adaptable to hydraulic seeding requirements. Storage tanks shall have a means of estimating the volume used or remaining in the tank.

212.05 Sodding.

- (a) *Soil Preparation.* Preparatory to sodding, the ground shall be tilled or hand worked into an even and loose sod bed to a depth of 4 inches, and irregularities in the ground surface shall be removed. Sticks, stones, debris,

clods, asphalt, concrete, and other material more than 2 inches in any dimension shall be removed. Any depressions or variances from a smooth grade shall be corrected. Areas to be sodded shall be smooth before any sodding is done.

- (b) *Sodding.* The sod shall be laid by staggering joints with all edges touching. On slopes, the sod shall run approximately parallel to the slope contours. Where the sod abuts a drop inlet, the subgrade shall be adjusted so that the sod shall be 1 ½ inch below the top of the inlet.

Within one hour after the sod is laid and fertilized it shall be watered. After watering the sod shall be permitted to dry to the point where it is still wet enough for effective rolling. It shall then be rolled in two directions with a lawn roller weighing at least 150 pounds.

- (c) *Fertilizing and Soil Conditioning.* Prior to laying sod, the 4 inches of subsoil underlying the sod shall be treated by tilling in fertilizer, soil conditioner, or both. The rate of application shall be as designated in the Contract. Fertilizer called for on the plans shall be worked into the top 4 inches of soil at the rate specified in the contract. Biological nutrient, culture or humic acid based material called for on the plans shall be applied uniformly onto the soil surface. Organic amendments shall be applied uniformly over the soil surface and incorporated into the top 6 inches of soil.

After laying, the sod shall be fertilized with a fertilizer having an available nutrient analysis of 20-10-5 at the rate of 200 pounds per acre. Fertilizer shall not be applied when the application will damage the sod.

212.06 Native Seeding. Areas that are unirrigated shall be seeded in accordance with subsection 212.03.

- (a) *Soil Preparation.* Slopes flatter than 2:1, shall be tilled into an even and loose seed bed 4 inches deep. Slopes 2:1 or steeper shall be left in a roughened condition. Slopes shall be free of clods, sticks, stones, debris, concrete, and asphalt in excess of 4 inches in any dimension, and brought to the desired line and grade.
- (b) *Fertilizing and Soil Conditioning.* Prior to seeding, fertilizer, soil conditioner, or both shall be applied. The fertilizer and soil conditioner type and rate of application shall be as designated in the Contract. Fertilizer called for on the plans shall be worked into the top 4 inches of soil at the rate specified in the contract. Biological nutrient, culture or humic acid based material called for on the plans shall be applied in a uniform application onto the soil surface. Organic amendments shall be applied uniformly over the soil surface and incorporated into the top 6 inches of soil. No measurable quantity of organic amendment shall be present on the surface after incorporation.

- (c) *Seeding.* Seeding shall be accomplished within 24 hours of tilling or scarifying to make special seed bed preparation unnecessary. The seeding application rate shall be as designated in the Contract. All slopes flatter than 2:1 shall be seeded by mechanical power drawn drills followed by packer wheels or drag chains. Mechanical power drawn drills shall have depth bands set to maintain a planting depth of at least ¼ inch and shall be set to space the rows not more than 7 inches apart. Seed that is extremely small shall be sowed from a separate hopper adjusted to the proper rate of application.

If strips greater than 7 inches between the rows have been left unplanted or other areas skipped, the Engineer will require additional seeding at the Contractor's expense.

When requested by the Contractor and approved by the Engineer, seeding may be accomplished by broadcast or hydraulic type seeders at twice the rate specified in the Contract at no additional cost to the project.

All seed sown by broadcast-type seeders shall be "raked in" or covered with soil to a depth of at least ¼ inch. Broadcasting seed will be permitted only on small areas not accessible to machine methods.

Hydraulic seeding equipment and accessories shall conform to the equipment and accessories described in subsection 212.04(c).

Seeded areas damaged due to circumstances beyond the Contractor's control shall be repaired and reseeded as ordered. Payment for this corrective work, when ordered, shall be at the contract prices.

Multiple seeding operations shall be anticipated as portions of job are completed to take advantage of growing conditions and to comply with Section 208 and subsection 212.03.

METHOD OF MEASUREMENT

212.07 The quantities of lawn seeding and native seeding will not be measured but shall be the quantities designated in the Contract, except that measurements will be made for revisions requested by the Engineer, or for discrepancies of plus or minus five percent of the total quantity designated in the Contract. The quantity of lawn seeding shall include soil preparation, water, fertilizer, and seed, completed and accepted. The quantity of native seeding shall include soil preparation, fertilizer, soil conditioner, and seed applied, completed, and accepted.

The quantity of sod to be measured will be the actual number of square feet, including soil preparation, water, fertilizer, and sod, completed and accepted.

When soil conditioner is measured and paid for separately, it will be measured by the actual number of acres to which soil conditioner is applied and will be paid for as Soil Conditioning.

212.08

The Contractor shall furnish the Engineer with seed certifications and analysis, fertilizer analysis, and bag weight tickets prior to placing any seed or fertilizer. Any seed or fertilizer placed by the Contractor without the Engineer's approval will not be paid for.

Measurement for acres will be by slope distances.

BASIS OF PAYMENT

212.08 The accepted quantities of lawn seeding, native seeding, soil conditioning, and sod will be paid for at the contract unit price for each of the pay items listed below that appear in the bid schedule.

Payment will be made under:

Pay Item	Pay Unit
Seeding (Lawn)	Acre
Seeding (Native)	Acre
Sod	Square Foot
Soil Conditioning	Acre

Soil preparation, water, seed, fertilizer, and soil conditioner, incorporated into the seeding sodding or soil conditioning will not be paid for separately but shall be included in the work.

Adjusting or readjusting seeding or fertilizing equipment will not be paid for separately but shall be included in the work.

SECTION 213 MULCHING

DESCRIPTION

213.01 This work consists of mulching the seeded areas, furnishing and placing wood chip mulch in the planting beds and plant saucers, furnishing and applying hydromulch with tackifier on roadway ditches and slopes, furnishing and placing tackifier on mulch or soil on roadway ditches or slopes, and furnishing and installing metal landscape border for the separation of planting beds, in accordance with the Contract or as directed. Mulching may be accomplished by the crimping method using straw or hay, by the hydraulic method using wood cellulose fiber mulch, or by other approved methods with approved materials. When a specific mulching method is required, it will be designated in the Contract.

This work includes furnishing and applying spray-on mulch blanket on top of rock cuts and slopes after seeding or as temporary stabilization as shown on the plans or as directed by the Engineer.

MATERIALS

213.02 Materials for mulching shall consist of Certified Weed Free field or marsh hay or straw of oats, barley, wheat, rye or triticale certified under the Colorado Department of Agriculture Weed Free Forage Certification Program and inspected as regulated by the Weed Free Forage Act, Title 35, Article 27.5, CRS. Each certified weed free mulch bale shall be identified by one of the following:

- (1) One of the ties binding the bale shall consist of blue and orange twine, or
- (2) The bale shall have a regional Forage Certification Program tag indicating the Regional Forage Certification Program Number.

Mulch shall be inspected for and Regionally Certified as weed free based on the Regionally Designated Noxious Weed and Undesirable Plant List for Colorado, Wyoming, Montana, Nebraska, Utah, Idaho, Kansas and South Dakota.

The Contractor shall not unload certified weed free mulch bales or remove their identifying twine, wire, or tags until the Engineer has inspected and accepted them.

The Contractor shall provide a transit certificate that has been filled out and signed by the grower and by the Department of Agriculture inspector.

The Contractor may obtain a current list of Colorado Weed Free Forage Crop Producers who have completed certification by contacting the Colorado Department of Agriculture, Division of Plant Industry.

Straw or hay in a stage of decomposition (discolored, brittle, rotten, or moldy) or old, dry mulch which breaks in the crimping process will not be accepted.

The type and application rate of mulch material shall be as designated in the Contract.

The hydromulch material for hydraulic mulching shall consist of virgin wood fibers manufactured expressly from clean whole wood chips. The chips shall be processed

in such a manner as to contain no growth or germination inhibiting factors. Fiber shall not be produced from recycled materials such as sawdust, paper, cardboard, or residue from pulp and paper plants. The wood cellulose fiber mulch shall be dyed green to aid in visual metering during application. The dye shall be biodegradable and not inhibit plant growth. The wood cellulose fibers of the mulch must maintain uniform suspension in water under agitation. Upon application, the mulch material shall form a blotter-like mat covering the ground. This mat shall have the characteristics of moisture absorption and percolation and shall cover and hold seed in contact with the soil. The Contractor shall obtain certifications from suppliers that laboratory and field testing of their product has been accomplished, and that it meets all of the foregoing requirements pertaining to wood cellulose fiber mulch.

The wood cellulose fiber mulch shall conform to the following specifications:

(1)	Percent moisture content	10.0% ± 3.0%
(2)	Percent Organic Matter*	99.3% ± 0.2%
	(Wood Cellulose Fiber)	
(3)	Percent Ash Content*	0.7% ± 0.2%
(4)	pH	4.9 ± 0.5
(5)	Water Holding Capacity*	1200-1600 grams**
	*Oven-Dried Basis	
	**Per 100 grams of fiber	

The wood cellulose fiber mulch shall be packaged in units containing current labels, with the manufacturer's name, the net weight, and certification that the material meets the foregoing requirements for wood cellulose fiber mulch.

Material for mulch tackifier shall consist of a free flowing, noncorrosive powder produced from the natural plant gum of *Plantago insularis* (Desert Indianwheat), applied in a slurry with water and wood fiber. The powder shall possess the following properties:

(1)	Protein content	1.6 ± 0.2%
(2)	Ash content	2.7 ± 0.2%
(3)	Fiber	4.0 ± 0.4%
(4)	pH 1% solution	6.5 - 8.0

The material used for mulch tackifier shall not contain any mineral filler, recycled cellulose fiber, clays, or other substances which may inhibit germination or growth of plants. Water shall conform to subsection 209.02.

Wood chip mulch shall consist of fresh, moist pole peelings material having approximate dimensions;

Width: ¼ to ½ inch; Length: 3 to 4 inches

The Contractor shall submit a sample to the Engineer for approval at least 30 days prior to placing on the project.

The metal landscape border shall consist of a strip of metal such as steel conforming to ASTM A 1011 or approved equal.

Spray-on mulch blanket shall consist of wood fibers bound together by adhesive and photodegradable synthetic fibers and premixed in an air stream at the factory. The fibers may be crimped or un-crimped. The wood fibers shall be manufactured expressly from clean whole wood chips and contain a range of fiber lengths, with a minimum of 25 percent of the fibers averaging 0.4 inches long. The adhesive binder shall be formulated to form a water resistant bond. The fibers shall be colored yellow or green with a water-soluble, non-toxic dye to help the operator apply the material uniformly. The mixture shall also contain a copolymer gel. A sample of the spray-on mulch blanket shall be submitted for approval at least two weeks in advance of its use on the project.

CONSTRUCTION REQUIREMENTS

213.03

- (a) *Hay or Straw Mulching.* After seeding has been completed or when required for erosion control, hay or straw shall be uniformly applied, with no bare soil showing, at the rate designated in the Contract or as directed. It shall be crimped in with a crimper or other approved equipment. The Engineer may order hand-crimping on areas where mechanical methods cannot be used.

The seeded area shall be mulched and crimped within four hours after seeding. Areas not mulched and crimped within four hours after seeding or prior to precipitation or damaging winds on site shall be reseeded with the specified seed mix at the Contractor's expense, prior to mulching and crimping.

When tackifier is required in the Contract it shall be applied in the following order: (1) hydraulic mulching, (2) mulch tackifier.

- (b) *Hydraulic Mulching.* Cellulose fiber mulch and tackifier shall be added to water to form a homogeneous slurry. The operator shall spray apply the slurry mixture uniformly over the designated seeded area.

Hydraulic mulching shall not be done in the presence of free surface water.

1. Mixing procedure for the hydraulic mulch and tackifier mixture shall be as follows:
 - (1) Fill tank with water approximately $\frac{1}{4}$ full.
 - (2) Continue filling while agitating with engine at full rpm.
 - (3) Pour tackifier, at a moderate rate, directly into area of greatest turbulence.
 - (4) With the recommended amount of tackifier in solution, add wood cellulose fiber mulch. Do not add fertilizer.

Apply the hydromulch and tackifier mixture at the following rate:

Wood Cellulose Fiber Mulch	Tackifier
2000 lbs./Acre	100 lbs./Acre

2. Mixing procedure for Mulch Tackifier shall be as follows:

- (1) Fill tank with desired amount of water and run engine at full R.P.M.
- (2) Add wood fiber. Agitate until a homogenous, non-lumpy slurry is formed. Do not add fertilizer
- (3) Slowly sift powdered tackifier into slurry and continue to agitate for at least five minutes.
- (4) Spray onto mulch or soil using a nozzle that will disperse the spray into a mist that will uniformly cover the mulch.

Application Rate: Apply this as an overspray at the following rate or as approved by the Engineer.

Powder	Fiber	Water
200 lbs./Acre	300 lbs./Acre	1000 gal./Acre

- (c) *General.* Mulch shall be tacked simultaneously or immediately upon completion of mulching and crimping to avoid non-uniform coverage. Areas not properly mulched, or areas damaged due to the Contractor's negligence, shall be repaired and remulched as described above, at the Contractor's expense.

Mulch removed by circumstances beyond the Contractor's control shall be repaired and remulched as ordered. Payment for this ordered corrective work shall be at the contract prices.

The Engineer may order test sections be established for adjusting the mulching equipment to assure conformance with the specified application rate. The Engineer may order equipment readjustment at any time.

- (d) *Wood Chip Mulch.* A 4-inch layer, unless otherwise shown in the plans, of wood chip mulch shall be uniformly applied to all planting beds as shown on the plans or as directed. Wood chip mulch shall be placed in all tree and shrub saucers in seeded areas. Wood chip mulch shall be capable of matting together to resist scattering by the wind.
- (e) *Metal Landscape Border.* Metal Landscape border shall be installed along the lines and at the grades shown on the plans by an approved method that will not damage the border. Ends of metal landscape border shall overlap the next adjacent section a minimum of 6 inches. Metal landscape border shall be anchored with wire tie-downs at intervals of approximately 2 feet. Wire tie-downs shall be 9 gage wire at least 14 inches long. Metal landscape border shall be inserted into the ground by driving against the wire tiedowns; ground may be moistened to ease entrance into the ground. Driving on edge of metal landscape border will not be permitted except when the edge is properly shielded. Metal landscape border may be bent for sharp angles, and overlapped at closure of perimeter.

- (f) *Spray-On Mulch Blanket*. A technical representative of the manufacturer or authorized distributor shall be present for the initial mixing and application of the spray-on mulch blanket.

Spray-on mulch blanket shall be mixed and applied according to the following procedure:

- (1) Mix spray-on mulch blanket at a ratio of 50 lbs. of spray-on mulch blanket per 125 gallons of water. Seed will not be mixed into the spray-on mixture.
- (2) Fill tank with water sufficient to reach the level of the agitator shaft.
- (3) Start mixing agitators and regulate throttle throughout the loading process to achieve agitation.
- (4) Load machine with spray-on mulch blanket and the balance of the required water. Load spray-on mulch blanket through breaker or break by hand.
- (5) Vigorously agitate the mixture for a minimum of ten minutes after loading to allow thickening. Reduce agitation to a minimum.
- (6) Apply mixture in even layers, working back and forth between top and bottom of the slope, to uniformly cover soil with the mixture. Spray the product through a fan or slit type nozzle (22 to 50 degree tip). The nozzle shall create a fine, uniformly dispersed spray that “rains down” on the soil.

Spray-on mulch blanket shall be applied at the rate of 2600 pounds per acre.

Spray-on mulch blanket shall have no cure time once applied.

Spray-on mulch blanket shall not be applied in ditches or other areas of concentrated flow.

METHOD OF MEASUREMENT

213.04 The quantity of hay and straw mulch, wood chip mulch, wood cellulose fiber hydromulch, and tackifier will not be measured but shall be the quantity designated in the Contract, except that measurements will be made for revisions requested by the Engineer, or for discrepancies of plus or minus five percent of the total quantity designated in the Contract. Measurement for acres will be by slope distances.

The quantity of mulch tackifier to be measured will be the actual number of pounds of dry tackifier powder used.

Metal landscape border will be measured by the linear foot of completed and accepted metal border. Measured length of metal landscape border will not include required overlap splices.

Spray-on mulch blanket will be measured by the actual number of acres to which it is applied based on slope distances.

BASIS OF PAYMENT

213.05 The accepted quantities will be paid for at the contract unit price for each of the pay items listed below that appear in the bid schedule.

Payment will be made under:

Pay Item	Pay Unit
Mulching (___)	Acre
Mulching (Weed Free Hay)	Acre
Mulching (Weed Free Straw)	Acre
Mulching (Wood Chip)	Cubic Foot
Mulch Tackifier	Pound
Metal Landscape Border ___ Inch	Linear Foot
Spray-on Mulch Blanket	Acre

Water, wood fiber, mixing and application for mulch tackifier will not be measured and paid for separately but shall be included in the work.

Adjusting or readjusting mulching equipment will not be paid for separately but shall be included in the work.

Payment for spray-on mulch blanket will be full compensation for all work and materials necessary to complete the item.

SECTION 214 PLANTING

DESCRIPTION

214.01 This work consists of furnishing and planting trees, shrubs, wetland perennials, and other plant material, hereinafter referred to as “plants” and obtaining live brush layer cuttings from on-site willow species designated by the Engineer near the project site and planting them in moist areas as shown on the plans or as directed.

MATERIALS

214.02 General. Plants shall be of the species or variety designated in the Contract, in healthy condition with normal well developed branch and root systems, and shall conform to the requirements of the current *American Standard for Nursery Stock*. The Contractor shall obtain certificates of inspection of plant materials that are required by Federal, State, or local laws, and submit the certificates to the Engineer.

All plants shall be free from plant diseases and insect pests. All shipments of plants shall comply with all nursery inspection and plant quarantine regulations of the State of origin and destination, and the Federal regulations governing Interstate movement of nursery stock.

The minimum acceptable sizes of all plants, with branches in normal position, shall conform to the measurements specified in the Contract.

Plants hardy in hardiness zones 2, 3, 4, and 5 only will be accepted. Hardiness zones are defined in U.S. Department of Agriculture publications.

All container grown plants shall be those plants that have been growing in a nursery for at least one growing season, or plants that have established themselves in accordance with definitions set forth in the Colorado Nursery Act, Title 35, Article 26, CRS.

Trees and shrubs shall have been root-pruned during their growing period in the nursery in accordance with standard nursery practice.

If plants of acceptable quality and specified variety or size are not available locally, the Contractor may:

- (1) Substitute acceptable plants that are larger than specified at no change in contract price.
- (2) On written approval, substitute smaller plants than those specified in the Contract at the adjusted price stated in the written approval.
- (3) On written approval, substitute plants of a different genus, species, or variety at the adjusted price stated in the written approval.

Before any substitution of plants will be considered, the Contractor shall furnish to the Engineer written statements from three sources verifying that the plants designated on the plans are not available.

At the landscape pre-construction conference, the Contractor shall name the nursery stock supplier for all items. The Contractor shall tag all nursery stock for inspection by the Engineer. The Engineer will reject any nursery stock not meeting the Contract at any of the three following times and locations:

- (1) At the named supplier's location. The Engineer will notify the Contractor when nursery stock will be inspected at the supplier's location.
- (2) On the project site at the time of delivery, prior to planting.
- (3) At the time of installation. Final acceptance of all plant material will be made at the time of installation on the project site.

Deciduous plants, broadleaf evergreens, and conifers shall be balled and burlapped, or in containers used in standard nursery practice. Balling and burlapping shall conform to the recommended specifications in the *American Standard for Nursery Stock*. The ball of the plant shall be natural, not made, and the plant shall be handled by the ball at all times. No balled and burlapped plant shall be accepted if the ball is broken or the trunk is loose in the ball.

Each species shall be identified by means of grower's label affixed to the plant. The grower's label shall include the data necessary to indicate conformance to specifications.

Plants for fall planting shall be furnished balled and burlapped or container-grown unless otherwise designated in the Contract or approved.

- (a) *Brush Layer Cuttings*. Brush layer cuttings taken from designated plants shall be at least 0.5 inch in diameter or larger. Brush layer cuttings shall be 24 to 36 inches long with the bottom end cut off at an angle and the top end with a straight cut. Cuttings shall be taken and installed while dormant in early spring. Cuttings shall not be planted when the ground is frozen. Brush layer cuttings shall be stored no longer than one week. The cuttings shall be stored by submerging them at least $\frac{2}{3}$ of their length in containers of water, free from any harmful oil, chemical, sprays, or other materials. The containers shall be kept in the shade.
- (b) *Wetland Perennial Plants*. Perennial wetland plants shall be supplied in containers as designated in the Contract; no bare root material will be allowed. The original plant stock for the plants shall be from Colorado. Perennial plants shall have been growing at least one growing season in the nursery. Perennial shall not be shipped while in a dormant condition. Perennials shall be a minimum of 6 inches in height when applicable to the species. Water shall be applied to wetland perennial plants until soil is saturated. Wetland perennial plants shall be watered thoroughly every day for a period of one month.

- (c) *Stakes.* Wood stakes shall be 2 inches x 2 inches square, or 2 ½ inch diameter and 6 feet long free from bends. Metal stakes shall be 6 feet long standard T-bar steel fence post or #4 or larger rebar. Wood stakes shall be made of untreated wood guaranteed to last in the ground at least two growing seasons. The bottom of wood stakes shall be pointed.
- (d) *Soil Conditioners and Fertilizer.* Soil conditioner shall consist of composted plant material, 90 percent ¼ inch or less with a carbon to nitrogen ratio of 15:1 to 25:1. A sample of the soil conditioner and certificate of compliance shall be provided to the Engineer to verify the organic matter content, and carbon matter to nitrogen ratio shall be submitted one month prior to planting for approval.

Fertilizer for planting shall be used as specified in the Contract.

CONSTRUCTION REQUIREMENTS

214.03 General. All plants shall be protected from drying out or other injury. Broken and damaged roots shall be pruned before planting.

- (a) *Planting Seasons.* Plants shall be planted in accordance with the Contract.

Areas to be planted shall be brought to the lines and grades designated or approved. The location of plants shown in the Contract is approximate to the degree that unsuitable planting locations shall be avoided. Trees shall be planted at least 30 feet from the edge of the traveled way, except when guardrail or vertical curb exists, this distance may be reduced to 20 feet. Locations and layouts shall be approved before preparatory work for planting is started. Shrubs shall not be planted closer than 6 feet from the edge of pavement.

All layout staking for planting shall be done by the Contractor and shall be approved by the Engineer before planting holes are prepared.

The Contractor shall place all plant material according to the approved planting plans, or as directed.

- (b) *Excavation.* Planting pits shall be circular in outline with vertical or sloped sides. Pits for trees and shrubs shall be at least two times greater in diameter than the earth ball.
- (c) *Planting.* Planting shall be done in accordance with good horticultural practices. Plants of upright growth shall be set plumb and plants of prostrate type shall be set normal to the ground surface. Plants with dry, broken, or crumbling roots will not be accepted for planting.

Planting pits shall be dug 2 to 4 inches shallower than the height of the rootball for trees, and 2 inches shallower for shrubs. In non-irrigated areas, planting pits shall be dug so that the top of the rootball is level with the final grade. The tree rootball shall be set in the center of the planting pit on undisturbed soil. Trees shall be stabilized and then the wire basket, any twine or wire, and burlap shall be removed before the pit is backfilled. Shrubs shall

be planted in the center of the pit. Plastic, metal, fabric, or peat containers shall be removed. Shallow scores $\frac{1}{4}$ to $\frac{1}{2}$ inch deep shall be made along the edges of the rootball.

Areas to be planted with ground cover shall be prepared by placing topsoil and a $\frac{1}{2}$ inch layer of soil conditioner on the ground surface, and roto-tilling to a depth of 6 inches. Ground cover shall be planted by excavating to a depth sufficient to accommodate the root structure of plant materials without crimping or bending roots. After planting, backfill shall be placed around the ground cover and compacted firmly around the roots. The planted areas shall be brought to a smooth and uniform grade, and then top dressed with a 2 inch mulch cover of the type specified on the plans.

- (d) *Backfilling.* When soil conditioner is specified, composted plant material shall be added and thoroughly mixed into the backfill material at the rate of 0.5 cubic foot per tree and 0.1 cubic foot per shrub.

Backfill shall be thoroughly worked and watered-in to eliminate air pockets. Watering shall be done immediately after the plant is placed. Backfilling of the planting pit shall be resumed after this water is absorbed. Roots and crown shall be covered with soil at this time. After the soil has settled, plants must be in the proper position and at the proper depth. Saucers shall be prepared around each plant to the dimensions shown on the planting details. When saucers are required they shall be covered with a 4 inch thick layer of fresh moist wood chip mulch conforming to Section 213. After completion of all planting and before acceptance of the work, the Contractor shall water plants installed under this Contract, as needed to maintain a moist root zone optimum for plant growth. Plants damaged by the Contractor's operations shall be replaced at the Contractor's expense.

Surplus soil remaining after backfilling is completed shall be used for constructing water retention berms, or, if not needed for berms, shall be thinly distributed (wasted) in the vicinity, subject to approval of the Engineer.

- (e) *Pruning.* All deciduous trees and shrubs shall be pruned in accordance with standard horticultural practice, preserving the natural character of the plant. Guidelines for pruning are indicated in the planting details. Pruning cuts shall be made with sharp clean tools.

All clippings shall become the property of the Contractor and be removed from the site.

- (f) *Staking.* All deciduous trees 2 inch caliper and greater shall be staked with two stakes. Stakes shall conform to subsection 214.02(c). Stakes shall be driven 2 feet into the ground with one stake on the side of the prevailing wind (generally the west side) and the other stake on the opposite side. Stakes shall be driven at least 1 foot outside each edge of the planting pit. Trees shall be guyed with 1 to 2 inch wide strips of nylon webbing with metal grommets.

Coniferous trees 4 feet or taller shall be staked as designated in the Contract or directed.

Stakes shall be spaced equally around the tree.

Trees specified to be guyed with wire shall be secured with No. 12 gage annealed galvanized steel wire free of bends and kinks.

- (g) *Wrapping Materials.* Wrapping material shall be horticulturally approved waterproof wrapping paper. Wrapping shall be applied from the base of the tree upward to the second scaffold branch and secured with arbor tape. *Populus sp.* are exempt from tree wrap. The Contractor shall submit the manufacturer's certification for the wrapping material requirements. Wrapping shall be done in the fall months prior to freeze, and removed in the spring. Wrapping shall not remain on any trees throughout the summer months. Wrapping shall be removed by the Contractor.

All plant tags shall be removed from plants and all packing or other material used by the Contractor shall be removed from the site.

- (h) *Brush Layer Cuttings.* Using a rock bar or other tool, holes at least 20 inches deep shall be made in the stream bank or other areas. A cutting shall be placed in each hole. If in riprap, the hole shall be backfilled with soil to within 3 inches of the riprap surface. The top 3 inches of the void shall be filled with gravel from the stream bank or streambed and compacted slightly. The remaining exposed length shall be cut off 2 to 3 inches above the ground line. The placement of these cuttings shall be in areas shown on the plans that remain damp or are seasonally inundated, as directed. Brush layer cuttings shall be planted at a density of one cutting per square yard on streambank or other designated areas that have been regraded, riprapped, or disturbed. The strip that is most successful for brush layer cutting establishment is only several yards wide and approximately, plus or minus, 2 feet from the ordinary high water line.

Water shall be applied to the brush layer cuttings planted areas until the soil mass is saturated. Brush layer cuttings shall be watered thoroughly every day for a period of one month.

- (i) *Irrigation.* Plantings that are to be irrigated shall be planted so that the irrigation system is operating and supplying the designated amount of water as planting is occurring. Plants shall be watered within 15 minutes of planting.

214.04 Landscape Establishment. From the time of installation, during construction, and throughout the Landscape Establishment period the Contractor shall maintain all plant material and seeded areas in a healthy and vigorous growing condition, and ensure the successful establishment of vegetation. This includes performing establishment, replacement work, and landscape maintenance work as described below.

The beginning of the Landscape Establishment period depends upon receipt of the written *Notice of Substantial Landscape Completion* from the Engineer. Substantial Landscape Completion occurs when all plant materials in the Contract

have been planted and all work under Sections 212, 213, 214 and 623 has been performed, except for the Section 214 pay item, Landscape Maintenance. If the Notice of Substantial Landscape Completion is issued during the spring planting season, the Landscape Establishment period begins immediately and lasts for a period of 12 months. If the Notice of Substantial Landscape Completion is issued at any other time, the Landscape Establishment period begins at the start of the next spring planting season and lasts for a period of 12 months.

- (a) *Establishment and Replacement.* After all planting on the project is complete, a plant inspection shall be held including the Contractor, Engineer and CDOT Landscape Architect to determine acceptability of plant material. During the inspection, an inventory of rejected material will be made, and corrective and necessary cleanup measures will be determined.

Dead, dying, or rejected material shall be removed each month during the Landscape Establishment period as directed. Plant replacement shall be performed during the spring planting seasons at the beginning and end of the Landscape Establishment Period. Plant replacement stock shall be planted in accordance with the Contract and is subject to all requirements specified for the original material. Plant replacement shall be at the Contractor's expense.

- (b) *Landscape Maintenance.* During the Landscape Establishment period the Contractor shall perform landscape maintenance as described herein. The Contractor shall maintain all landscaped areas in the condition they were in when first installed and accepted.

Prior to the Notice of Substantial Landscape Completion, the Contractor shall submit a detailed maintenance plan which includes a schedule showing the number of hours or days personnel will be present, the type of work to be performed, supervision, equipment and supplies to be used, emergency program and responsible person to contact for emergency work, and inspection schedule. The detailed maintenance plan is subject to review and approval by the Engineer. The Engineer will not issue the Notice of Substantial Completion until the Engineer has received and approved the maintenance plan.

The proposed types, brand names, material safety data sheets, and rates of application of herbicides, pesticides, and fertilizers to be used shall be submitted for approval with the detailed maintenance plan. Herbicides, pesticides, and fertilizers shall meet all local, state, and federal regulations and shall be applied by a licensed applicator.

The Contractor shall perform start-up, watering, programming, operation, and fall winterization of the irrigation system. The Contractor shall do a spring start-up of the irrigation system prior to Final Acceptance and perform all irrigation system warranty work as specified in Section 623.

The Contractor shall keep a project diary documenting all landscape and irrigation maintenance activities including work locations and time spent. The Contractor shall provide copies of the diary to the Engineer upon request.

The Contractor shall restore and reseed eroded areas and areas of poor establishment in accordance with Sections 212 and 213. The Contractor shall maintain staking and guying until the end of the Landscape Establishment period. The Contractor shall remove all guying wire, straps, and stakes at the end of the Landscape Establishment period.

During the landscape establishment period, the Contractor shall water, cultivate, and prune the plants and repair, replace, or readjust guy material, stakes, and posts as required or directed by the Engineer. The Contractor shall reshape plant saucers, repair washouts and gullies, replace lost wood chip mulch, keep all planting sites free from weeds and do other work necessary to maintain the plants in a healthy and vigorous growing condition. This includes seasonal spraying or deep root watering with approved insecticides or fungicides as required.

1. *Watering in Irrigated Areas.* Trees planted at all locations on the project shall be watered once per month at the rate of 30 gallons per tree for the months November through April until the Landscape Establishment period ends.

Shrubs planted at all locations on the project shall be watered once per month at the rate of 10 gallons per shrub for the months November through April until the Landscape Establishment period ends.

2. *Watering in Non-irrigated Areas.* Trees planted shall be watered twice per month by the Contractor at the rate of 30 gallons per tree per watering for the months May through October, and once per month at the rate of 30 gallons per tree for the months November through April of the 12 month period following planting.

Shrubs planted in upland areas shall be watered twice per month by the Contractor at the rate of 10 gallons per shrub per watering for the months May through October, and shall be watered once per month at the rate of 10 gallons per shrub for the months November through April of the 12 month period following planting.

The contract performance bond, required by subsection 103.03, shall guarantee replacement work during the plant establishment period.

If all other work is completed on a project, no contract time will be charged during the plant establishment period.

METHOD OF MEASUREMENT

214.05 The quantity of planting to be measured will be the number of plants, of the types and sizes designated in the Contract, that are actually planted and accepted.

The quantity of brush layer cuttings will be measured by the actual number planted, complete in place and accepted.

Landscape Maintenance will not be measured, but will be paid for on a lump sum basis.

BASIS OF PAYMENT

214.06 The accepted quantities of planting, and brush layer cuttings will be paid for at the contract unit price for each of the various items listed below that appear in the bid schedule.

Payment for the total cost of the item will be made at the completion of planting.

Cost of the performance bond shall be included in the cost of the plant items.

Payment will be made under:

Pay Item	Pay Unit
_____ Tree ____ Inch Caliper	Each
_____ Tree ____ Foot	Each
_____ Shrub (____ Gallon Container)	Each
Perennials (____ Quart Container)	Each
Perennials (____ Gallon Container)	Each
Brush Layer Cuttings	Each
Landscape Maintenance	Lump Sum

Water required for all items of work will not be measured and paid for separately, but shall be included in the work.

Payment shall be full compensation for all work necessary to complete the item.

For each month that landscape maintenance is performed and accepted during the Landscape Maintenance period as specified in subsection 214.04, payment for Landscape maintenance will be made in installments as follows:

- (1) 10 percent of the lump sum amount will be paid for each of the eight growing season months, March through October.
- (2) 5 percent of the lump sum amount will be paid for each of the winter months, November through February.

Landscape maintenance performed during construction will not be measured and paid for separately, but shall be included in the work.

Landscape Establishment, except for landscape maintenance, will not be paid for separately, but shall be included in the work.

SECTION 216 SOIL RETENTION COVERING

DESCRIPTION

216.01 This work consists of furnishing, preparing, applying, placing, and securing soil retention covering for erosion control on roadway ditches or slopes as designated in the Contract or as directed.

MATERIALS

216.02

- (a) *Covering.* Covering shall consist of blankets with close weave mesh and nettings with open weave mesh made of various materials as specified herein.

Blankets and nettings shall be photodegradable or biodegradable, non-toxic to vegetation or germination of seed, and shall not be toxic or injurious to humans.

1. *Excelsior.* Excelsior soil retention covering shall be either photodegradable or biodegradable as follows.
 - A. The blanket shall consist of a machine produced mat of curled wood excelsior of 80 percent, 6 inch or longer fiber length with a consistent thickness of fibers evenly distributed over the entire area of the blanket. The top side of the blanket shall be covered with a photodegradable extruded plastic mesh and stitched on 2 inch centers the entire width of the blanket.

Dimensions:	48 inches by 180 feet or 96 inches by 90 feet
Roll Weight:	0.9 to 1.1 pounds per sq. yd.
 - B. The blanket shall consist of a machine produced mat of curled wood excelsior of 80 percent, 6 inch or longer fiber length with a consistent thickness of fibers evenly distributed over the entire area of the blanket. The top side of the blanket shall be covered with biodegradable netting, manufactured from jute or another biodegradable material and stitched on 2 inch centers the entire width of the blanket.

Dimensions:	48 inches by 180 feet or 96 inches by 90 feet
Roll Weight:	0.9 to 1.1 pounds per sq. yd.
2. *Soil Retention Blanket (Coconut).* Soil Retention Blanket (Coconut) shall be a machine produced mat consisting of 100 percent coconut fiber. The blanket shall be of consistent thickness with the coconut fiber evenly distributed over the entire area of the mat. The blanket shall be covered on the top and bottom side with polypropylene netting having ultraviolet additives to reduce breakdown and an approximate $\frac{5}{8}$ inch by $\frac{5}{8}$ inch mesh size. The blanket shall be sewn together with polyester, biodegradable or photodegradable thread.

Material requirements:

Coconut Fiber Content:	100%, 0.50 to 0.60 lb./sq. yd.
Netting:	Both sides, heavyweight nondegradable 3 lbs./1000 sq. ft.
Thread:	Polyester, biodegradable or photodegradable
Roll Width:	6.5 to 7.5 feet
Roll Length:	83.5 to 90 feet
Area Covered by One Roll:	60 to 75 sq. yds.

A sample of the soil retention blanket (coconut) shall be submitted at least 2 weeks in advance of its use on the project for approval by the Engineer.

3. *Soil Retention Blanket (Straw)*. Soil Retention Blanket (Straw) shall be a machine produced mat consisting of 100 percent agricultural straw. The blanket shall be of consistent thickness with the straw evenly distributed over the entire area of the mat. The blanket shall be covered on the top side with polypropylene netting having an approximate $\frac{5}{8}$ inch x $\frac{5}{8}$ inch to $\frac{1}{2}$ inch x $\frac{1}{2}$ inch mesh and on the bottom with polypropylene netting with an approximate $\frac{1}{4}$ inch x $\frac{1}{4}$ inch to $\frac{1}{2}$ inch x $\frac{1}{2}$ inch mesh. The blanket shall be sewn together with biodegradable or photodegradable thread.

Material requirements:

Straw Content:	100% 0.50 lb./sq. yd.
Netting:	Bottom side lightweight polypropylene photodegradable 1 to 1.65 lbs. per 1000 sq. ft. Top side heavyweight or lightweight polypropylene photodegradable 1.65 to 3 lbs. per 1000 sq. ft.
Thread:	Biodegradable or photodegradable
Roll Width:	6.5 to 7.5 feet
Roll Length:	83.5 to 90 feet
Area Covered by One Roll:	60 to 75 sq. yds

A sample of the soil retention blanket (straw) shall be submitted at least 2 weeks in advance of its use on the project for approval by the Engineer.

4. *Soil Retention Blanket (Straw and Coconut)*. Soil Retention Blanket (Straw/Coconut) shall be a machine produced mat consisting of 70 percent agricultural straw and 30 percent coconut fiber. The blanket shall be of consistent thickness with the straw and coconut fiber evenly distributed over the entire area of the mat. The blanket shall be covered

on the top side with polypropylene netting having an approximate $\frac{5}{8}$ inch x $\frac{5}{8}$ inch mesh and on the bottom with polypropylene netting with an approximate $\frac{1}{4}$ inch x $\frac{1}{4}$ inch to $\frac{1}{2}$ inch x $\frac{1}{2}$ inch mesh. The blanket shall be sewn together with cotton, biodegradable or photodegradable thread.

Material requirements:

Straw Content:	70% 0.35 lb./sq. yd.
Coconut Fiber Content	30% 0.15 lb./sq. yd.
Netting:	Bottom side lightweight polypropylene photodegradable 1 to 1.65 lbs. per 1000 sq. ft. Top side heavyweight or lightweight polypropylene photodegradable 1.65 to 3 lbs. per 1000 sq. ft.
Thread:	Cotton, biodegradable or photodegradable
Roll Width:	6.5 to 7.5 feet
Roll Length:	83.5 to 90 feet
Area Covered by One Roll:	60 to 75 sq. yds

A sample of the soil retention blanket (straw and coconut) shall be submitted at least 2 weeks in advance of its use on the project for approval by the Engineer.

- (b) *Pins and Staples.* Pins and staples shall be made of wire 0.162 inch or larger in diameter. “U” shaped staples shall have legs 8 inches long and a 1 inch crown. “T” shaped pins shall not be used.

CONSTRUCTION REQUIREMENTS

216.03

- (a) *Excelsior.* The area to be covered shall be prepared, fertilized, and seeded in accordance with Section 212, before the blanket is placed. When the blanket is unrolled, the netting shall be on top and the fibers shall be in contact with the soil. In ditches, blankets shall be unrolled in the direction of the flow of water. The end of the upstream blanket shall overlap the buried end of the downstream blanket a maximum of 8 inches and a minimum of 4 inches, forming a junction slot. This junction slot shall be stapled across at 8 inch intervals. Adjoining blankets (side by side) shall be offset 8 inches from center of ditch and overlapped a minimum of 4 inches. Six staples shall be used across the start of each roll, at 4 foot intervals, alternating the center row so that the staples form an “X” pattern. A common row of staples shall be used on adjoining blankets.
- (b) *Soil Retention Blanket (Coconut), (Straw), and (Straw and Coconut).* The area to be covered with Soil Retention Blanket (Coconut), (Straw), and (Straw/Coconut) shall be properly prepared, fertilized, and seeded before the blanket is placed. When the blanket is unrolled, the heavyweight polypropylene netting

shall be on top and the lightweight polypropylene netting shall be in contact with the soil. In ditches and on slopes, blankets shall be unrolled in the direction of the flow of water. Installation shall be in accordance with manufacturer's recommendations. A representative of the manufacturer shall be present to give instruction during the installation of the soil retention blanket.

The blanket shall be placed smoothly but loosely on the soil surface without stretching. The upslope end shall be buried in a trench 6 inches wide by 6 inches deep beyond the crest of the slope to avoid undercutting. For slope applications, there shall be a 6 inch overlap wherever one roll of blanket ends and another begins with the uphill blanket placed on top of the blanket on the downhill side. There shall be a 4 inch overlap wherever 2 widths of blanket are applied side by side. Insert staples in a pattern according to the manufacturer's recommendation at approximately 2 staples per square yard.

At terminal ends, and every 35 feet, Soil Retention Blanket (Coconut), (Straw), and (Straw/Coconut) placed in ditches shall be buried in a trench approximately 6 inches deep by 6 inches wide. Before backfilling, staples shall be placed across the width of the trench spaced at 6 inches on center in a zigzag pattern. The trench shall then be backfilled to grade and compacted by foot tamping.

- (c) *Maintenance.* The Contractor shall maintain the blanket, fabric, or netting areas until all work on the Contract has been completed and accepted. Maintenance shall consist of the repair of areas where damage is due to the Contractor's operations. Maintenance shall be performed at the Contractor's expense. Repair of those areas damaged by wind, fire, or other causes not attributable to the Contractor's operations shall be repaired by the Contractor and will be paid for at the contract unit price. Areas shall be repaired to reestablish the condition and grade of the soil prior to application of the covering and shall be refertilized, reseeded, and remulched as directed.

METHOD OF MEASUREMENT

216.04 Soil retention covering, including staples, complete in place and accepted, will be measured by the square yard of finished surface. No allowance will be made for overlap.

BASIS OF PAYMENT

216.05 The accepted quantities of soil retention covering will be paid for at the contract unit price per square yard.

Payment will be made under:

Pay Item	Pay Unit
Soil Retention Blanket (____)	Square Yard

Preparation of seedbed, fertilizing, and seeding will be measured and paid for in accordance with Section 212.

Mulching will be measured and paid for in accordance with Section 213.

SECTION 250 ENVIRONMENTAL, HEALTH AND SAFETY MANAGEMENT

DESCRIPTION

250.01 This work consists of protection of the environment, persons, and property from contaminants that may be encountered on the Project. This includes monitoring the work for encounters with contaminants or suspected contaminants; the management of solid, special, and hazardous waste; and management of visual emissions associated with hazardous waste, when encountered on the project.

MATERIALS AND EQUIPMENT

250.02 The Contractor shall furnish all personnel, materials, equipment, laboratory services and traffic control necessary to perform the contamination monitoring, testing, and site remediation when required. Traffic control shall be in accordance with the requirements of Section 630.

Monitoring equipment used to detect flammable gas, oxygen level, and toxic gas shall be capable of detection to meet the following standards:

Instrument Detection

Constituent	Threshold Limit	Increments
Flammable Gas	1% LEL	1%
Oxygen	19%	0.1%
Toxic Gas	1 PPM	1 PPM

LEL = lower explosive limit

PPM = parts per million

CONSTRUCTION REQUIREMENTS

250.03 General. Prospective bidders, including subcontractors, are required to review the environmental documents available for this project. These documents are listed in subsection 102.05 as revised for this project.

This project may be in the vicinity of property associated with petroleum products, heavy metal based paint, landfill, buried foundations, abandoned utility lines, industrial area or other sites which can yield hazardous substances or produce dangerous gases. These hazardous substances or gases can migrate within or into the construction area and could create hazardous conditions. The Contractor shall use appropriate methods to reduce and control known landfill, industrial gases, and visible emissions from asbestos encounters and hazardous substances which exist or migrate into the construction area.

Encountering suspected contaminated material, including groundwater, old foundations, building materials, demolition debris, or utility lines that may contain asbestos or be contaminated by asbestos, is possible at some point during the construction of this project. When suspected contaminated material, including

groundwater, is encountered or brought to the surface, the procedures under subsection 250.03(d)4 shall be followed.

Transportation of waste materials on public highways, streets and roadways shall be done in accordance with Title 49, Code of Federal Regulations (CFR). All labeling, manifesting, transportation, etc. of waste materials generated on this project shall be coordinated with the Engineer. All hazardous waste manifests for waste materials generated on this project shall list the Colorado Department of Transportation as the generator of the waste materials except as otherwise noted. If the Contractor contaminates the site, the Contractor shall be listed as the generator on the hazardous waste manifests, permits, and other documents for such material. If the project is not on a State Highway or frontage road, then the appropriate local governmental entity having jurisdiction over the transportation system facility shall be listed as the hazardous waste generator.

If waste materials must be handled in a permitted treatment, storage and disposal (TSD) facility, the facility shall be designated in writing by the Engineer. If the waste materials are the result of the Contractor's actions, the Contractor shall designate the facility.

The hazardous waste transportation phase of the work involves insurance required by law and regulations. If the waste materials are determined to be hazardous, the Contractor must submit proof that the transportation company is covered by the appropriate type and amount of insurance required by laws and regulations governing the transportation of hazardous waste.

The Contractor alone bears the responsibility for determining that the work is accomplished in strict accordance with all applicable federal, state and local laws, regulations, standards, and codes governing special waste, petroleum and hazardous substance encounters and releases.

The Contract will list known or suspected areas of contamination. Health and Safety Officer, Monitoring Technician, and Health and Safety Plan shall be required when so stated in the Contract.

- (a) *Health and Safety Officer (HSO)*. The Contractor shall designate a HSO, not the project superintendent, who shall have at least two years field experience in chemical related health and safety. The HSO shall be either a certified industrial hygienist (CIH), certified hazardous materials manager (CHMM), professional engineer (PE) licensed in the State of Colorado, certified safety professional (CSP), or registered environmental manager (REM) meeting the criteria set forth in 29 CFR 1926. When asbestos is present or is suspected to be present, the HSO shall have additional training and certification in accordance with the Air Quality Control Commission Regulation No. 8 Part B. The HSO shall meet the minimum training and medical surveillance requirements established by the Occupational Safety and Health Administration (OSHA) and the Environmental Protection Agency (EPA) for a supervisory Site Safety Official per 29 CFR 1962.65. The Contractor shall furnish documentation to the Engineer, at the preconstruction conference, that the above requirements have been met.

The HSO shall be equipped with the following:

- (1) Communication equipment as required in subsection 250.03(d)2.A. and a vehicle.
- (2) Monitoring and detection equipment for flammable gas, oxygen sufficiency, toxic gas, radiological screening and other hazards. This includes, as required, a combustible gas indicator, flame ionization or photo ionization detector, oxygen meter, radiation monitor with Geiger Mueller detector and other foreseeable equipment.
- (3) Depth gauging equipment, sampling equipment and sampling containers.
- (4) Personal protective equipment (levels C and D) when required.

The HSO shall recommend and supervise those actions which will minimize the risk of hazardous substance related injury to the workers, Department personnel, the general public, property and the environment. Hazardous substance is defined in 29 CFR 1926.32. The HSO shall prepare written procedures for the monitoring of confined space entry and working in or near excavations, including but not limited to trenches and drill holes associated with this project. The HSO shall conduct or supervise all hazardous substance and solid waste related testing, sampling, monitoring and handling for this project to ensure compliance with applicable statutes and regulations, and other applicable environmental requirements under subsections 107.01 and 107.02.

The HSO shall be available for consultation and assistance with contaminated materials related testing, sampling, and field monitoring as required by the Engineer.

The HSO shall prepare and submit a bound and indexed final site report to the Engineer at the end of the project. This site report shall include a detailed summary of all contaminated materials and contaminated water that were encountered and their final disposition.

During each week the HSO is utilized, the HSO shall prepare a daily diary which shall be submitted to the Contractor and the Engineer. This diary shall be submitted at the end of the week and shall become a part of the Department's records. The diary shall contain a chronological log of activities on the project including: dates and times on site, equipment used and calibrations, field monitoring results, visual observations, conversations, directives both given and received, and disposition of suspected hazardous substances. The Engineer will review this submittal and approve the actual number of hours to be paid.

- (b) *Monitoring Technician (MT)*. The Contractor shall designate a monitoring technician to be responsible for monitoring of hazardous substances during work on the project. The MT shall have a minimum of two years of actual field experience in assessment and remediation of hazardous substances that may be encountered during highway construction projects. The MT shall be experienced in the operation of monitoring devices, identifying substances

based upon experience and observation, and field sampling (for testing) of all media that may be found on the site. Completion of the 40 hour hazardous waste and 8 hour supervisory training required by OSHA and U.S. EPA rules and regulations which complies with the accreditation criteria under the provisions of the proposed 29 CFR 1910.121 is required prior to beginning work. The Contractor shall furnish documentation at the Preconstruction Conference that demonstrates these requirements have been met.

The MT shall be equipped with the following:

- (1) Communication equipment as required in subsection 250.03(d)2.A. and a vehicle.
- (2) Monitoring and detection equipment for flammable gas, oxygen sufficiency, toxic gas, radiological screening and other hazards. This includes, as required, a combustible gas indicator, flame ionization or photo ionization detector, oxygen meter, radiation monitor with Geiger Mueller detector and other foreseeable equipment.
- (3) Personal protective equipment (levels C and D) when required.

The MT shall be present on site and perform monitoring as required by 250.03(d) when work is being performed in areas of suspected contamination and on a predetermined basis throughout other work on the project.

The MT shall monitor for compliance with regulations, the project Health and Safety Plan and the Materials Management Plan (if they exist for the project), the Contract, and the environmental documents for the project. The MT shall immediately notify the Contractor, the Engineer and the HSO of any hazardous condition.

During each week the MT is utilized, the MT shall prepare a daily monitoring diary which shall be submitted to the Contractor, HSO and the Engineer. This diary shall be submitted at the end of the week and shall become a part of the Department's records. The diary shall contain a chronological log of activities on the project including: dates and times on site, equipment used and calibrations, field monitoring results, visual observations, conversations, directives both given and received, and disposition of suspected hazardous substances. The Engineer will review this submittal and approve the actual number of hours to be paid.

- (c) *Health and Safety Plan (HASP)*. The HSO shall prepare a written HASP for the project, formatted as shown in Appendix B, *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, DHHS (NIOSH) Publication Number 85-115, available from the Superintendent of Documents, U.S. Government Printing Office. The Contractor and the HSO shall review the environmental documents listed prior to preparation of the HASP.

Four signed copies of the HASP shall be furnished to the Engineer for acceptance. The Engineer shall have seven calendar days to review and accept or reject the proposed HASP. Within five calendar days after

acceptance, the HSO shall distribute signed and stamped (or sealed) copies of the accepted HASP to each emergency response agency servicing the project area, the HASP designated emergency hospital, and five copies to the Engineer. Earth or demolition work shall not occur until after the HASP is accepted and the HASP has been distributed. The HASP shall also be available to the Contractor's employees, their representatives, and officials of OSHA, EPA, Colorado Department of Public Health and Environment (CDPHE), local government health department, Federal Highway Administration, and other appropriate agencies and officials as may be designated by the Engineer. The Engineer will distribute the accepted HASP to appropriate Department personnel. The HASP shall be kept current and shall be revised by the HSO as warranted by changes in the field conditions.

All on-site workers (Contractor's, Department's, Utilities', and others) shall be briefed by the HSO on the contents of the HASP and any revisions thereof. The HSO shall conduct briefings (group or individual) to inform new employees, subcontractors, utility companies and other on-site workers of the HASP contents prior to their entry on site. All personnel involved in excavation or other soil disturbing activities shall receive the required two-hour training by a Certified Asbestos Inspector or Certified Abatement Designer, when asbestos discoveries are anticipated, or discoveries are made. A signature log of all briefing attendees shall be kept and furnished to the Engineer.

The Contractor shall provide, as required, eye wash equipment and stations, emergency showers, hand and face washing facilities and first aid equipment.

The Contractor shall provide, as required, decontamination facilities for personnel and equipment employed in the work. The exact procedure for decontamination and frequency shall be included in the accepted HASP. Decontamination facilities shall meet the criteria set forth in the Code of Federal Regulations (29 CFR and 40 CFR).

- (d) *Precautions and Procedures.* The following minimum precautions and procedures shall be followed during the construction of the project:
1. General construction precautions:
 - A. All monitoring and piezometer wells and test borings shall be established or abandoned by the Contractor as regulated by the State Engineer's Office. Copies of all required permits, notification, and abandonment documents shall be submitted to the Engineer prior to payment approval.
 - B. Hazardous substance related activities shall have a work plan for each work phase which shall be coordinated with the Engineer at least three working days prior to commencement of each phase of the work.
 - C. The Contractor shall properly handle all investigation derived waste generated by this project. Documentation shall be submitted to the Engineer of all tests performed for Treatment, Storage and Disposal

(TSD) determination; classification of waste; hauling records; TSD acceptance; manifest (if required); etc. in accordance with applicable laws and regulations.

- D. When the work may involve air emissions, the Contractor shall contact the Colorado Department of Public Health and Environment (CDPHE), Air Pollution Control Division to ascertain if an air pollution emission notice (APEN) or permit is required for this operation. The Contractor shall be responsible for filing the APEN and obtaining said permit, if required. The processing of air pollution permits, if required, in non-attainment areas or where public hearings are required, likely will take more than 90 days.
2. For construction on a known or potentially contaminated site, the following conditions shall apply, in addition to those listed in subsection 250.03(d)1:
 - A. The HSO shall be on site or readily available by radio, telephone or pager at all times during the work. When on site, the HSO shall have an operational portable or mobile cellular telephone available for immediate use in areas where such service is available. When on site in cellular telephone non-service areas, the HSO shall have available, for immediate use, radio access to a site with telephone service. The HSO shall be notified at least 24 hours prior to the start of confined space entry, storage tank removal, drilling, excavation, trenching, or dewatering operations.
 - B. The HSO shall designate the on site monitoring equipment for flammable gases, oxygen deficient or enriched atmosphere, and toxic gases, such as but not limited to, a flame ionization detector, photoionization detector, combustible gas indicator, and oxygen meter. This designated equipment shall be on site during all construction operations and be utilized during trenching, drilling, excavating, confined space entry, underground storage tank removal, and other appropriate construction operations. The exact equipment to fulfill this requirement shall be specified in the accepted HASP. The HSO shall conduct or supervise the monitoring. The monitoring equipment shall be calibrated as recommended by the manufacturer.
 - C. When drilling, trenching, or excavating in the presence of detectable concentrations of explosive gases, the soil shall be wetted and the operating equipment shall be provided with spark proof exhausts.
 - D. The Contractor, through the HSO, is responsible for ensuring that 29 CFR 1926 is fully complied with during the construction of the project.
 - E. Affected excavation operations shall be discontinued and personnel shall be removed from the affected excavation sites where any of the following levels are detected:

- (1) 20.0 percent or more LEL flammable gas, or 10.0 percent in an underground or confined space,
 - (2) Permissible Exposure Limit (PEL) of any toxic gas,
 - (3) 19.5 percent or less oxygen,
 - (4) 25.0 percent or more oxygen,
 - (5) Greater than 2 mrem/hr. (Beta particle & photon radioactivity),
 - (6) Greater than 15 pCi/L (Gross alpha particle activity), or
 - (7) Other action levels as determined by the HSO.
 - (8) Any quantity of ACM, including but not limited to, buried facility components, active or abandoned utility lines, buried foundations and demolition debris, or miscellaneous ACM dispersed in the soil.
- F. Personnel shall be issued and utilize appropriate Health and Safety equipment as determined by the HSO, who shall provide the Engineer with a written explanation of what personal protective equipment (PPE) shall be worn, when, and by which personnel. Except in emergency cases, the Engineer shall be advised by the HSO of changes in the degree of PPE prior to implementation.
- G. Personnel shall avoid the area immediately downwind of any excavation unless the excavation is monitored and declared safe.
- H. The operators of excavating, trenching, or drilling equipment shall wear appropriate PPE as required in the HASP.
- I. Exhaust blowers shall be present at the location where required in the accepted HASP.
- J. The Contractor shall accomplish the work with employees who have been trained and equipped as required by the HASP and applicable provisions of 29 CFR 1910 and 29 CFR 1926.
- K. Fire extinguishers, electrical equipment and wiring shall conform to the applicable requirements of 29 CFR 1926 and 49 CFR.
- L. Smoking shall not be permitted within 50 feet of any excavation.
3. For construction within 1000 feet of a known or potentially contaminated site, the following conditions, in addition to those listed in subsection 250.03(d) 1. shall apply:
- A. The areas under construction shall be checked with a combustible gas indicator before excavation begins to determine if flammable or combustible gas is in the area.
 - B. Excavations, trenches and drill holes shall be monitored by the HSO for flammable gas, toxic gas and oxygen deficiency

or enrichment. This shall be carried out continuously unless the presence of flammable, combustible or toxic gas, or oxygen deficiency or enrichment in the area can be ruled out by the HSO. The recommendation to discontinue monitoring must be agreed to by the Engineer and the Contractor. Prior to implementation, this agreement shall be written, and shall contain specific conditions that will require re-evaluation of the area.

- C. When flammable or toxic gas is found in the area, those precautions and procedures in subsection 250.03(d)2 shall apply.
4. The following procedures shall be followed if the level of contamination as documented in the environmental documents referenced in subsection 102.05 as revised for this project is exceeded, or if previously unidentified contaminated air, soil or water, is encountered during the construction of the project:
- A. Work in the immediate area of the release or discovery of contamination shall cease. The Engineer shall be immediately notified.
 - B. If no HSO is required by the Contract, the Contractor shall designate an HSO as directed, in accordance with subsection 250.03(a).
 - C. The Engineer may direct the HSO to evaluate the material for potential hazardous substance or other contamination or unsafe conditions. This evaluation may include, but is not limited to, on site field monitoring, on site testing, and on or off site laboratory analysis. Removal of storage tanks and surrounding contaminated soils shall be in accordance with applicable laws, regulations and established procedures. If the contaminated material cannot be placed in the embankment or remediated on site, it must be removed to an appropriate TSD facility, as designated in writing by the Engineer. The HSO shall supervise the necessary testing required to make appropriate TSD determinations. Disposal of the unsuitable material shall be considered as remediation work as described in subsection 250.03(d)4.D and 250.03(d)4.E.
 - D. If this site is determined to be contaminated with petroleum products, hazardous substances or other solid waste in excess of that indicated in the above listed site investigation documents, a thorough Site Investigation and Waste Management Plan may be accomplished under the supervision of the HSO, if proposed by the HSO and approved by the Engineer. This investigation and study shall determine the extent of contamination and study the feasibility of at least three types of remedial action for the contaminated area as required by applicable statutes and regulations. The HSO shall be available to assist the Engineer in explaining this study to the regulatory agencies. The Contractor shall prepare the Remediation Plan as directed. The time required for the Engineer's review of the

Remediation Plan, including all necessary drawings, calculations, specifications, and other documentation will not exceed four weeks after a complete submittal is received. This work shall not be done unless authorized in writing by the Engineer.

- E. If the site is determined to be contaminated with petroleum products; hazardous chemicals, materials, or wastes; or other solid wastes, and is required to be remediated, the HSO or other qualified individuals will supervise the Remediation Plan implementation as concurred to by the regulatory agencies, as directed. Hazardous Waste generated by remedial activities shall list the Colorado Department of Transportation as the hazardous waste generator on the required paperwork for projects on State Highways and their associated frontage roads. If this project is not on a State Highway or frontage road, then the appropriate local governmental entity having jurisdiction over the transportation system facility shall be listed as the hazardous waste generator. If the waste produced was caused by Contractor action, the Contractor shall be listed as the hazardous waste generator. Remediation work shall be done only when authorized by the Engineer in writing.

250.04 Heavy Metal Based Paint Management. When the work includes the removal of paint or items covered with paint which may contain lead, chromium or other heavy metals, the requirements of this subsection shall apply in addition to the requirements of subsection 250.03.

The requirements of the HASP shall be in accordance with OSHA Publication Number 3142, *Working with Lead in the Construction Industry*.

Paint Removal and Waste Disposal work shall be performed in accordance with 29 CFR 1926.62, State and local air quality regulations, the Steel Structures Painting Council (SSPC) Guide for Containing Debris Generated During Paint Removal Operations, the *Industrial Lead Paint Removal Handbook* (SSPC 91-18), and the references contained therein.

The following minimum precautions and procedures shall be followed unless modified in the approved HASP or its updates:

- (a) The Contractor shall contact the CDPHE, Air Pollution Control Division to ascertain if an air pollution permit is required for the cleaning or demolition work. If an air pollution permit is required, the Contractor shall obtain the permit. The Contractor shall furnish the Engineer with a copy of the permit application and the permit issued prior to starting cleaning or demolition activities. A copy of the Air Pollution Emission Notice [APEN] shall be provided to the Engineer, if such notice is required under the Colorado Air Quality Control Commission's regulations. The processing of air pollution permits in non-attainment areas, or where public hearings are required, likely will take more than 90 days.

- (b) The Contractor shall contain paint chips, corrosion residues, and spent abrasives, herein referred to as waste materials, resulting from the cleaning or demolition operations. The Contractor shall not deposit or release waste material into the water, air or onto the ground below or adjacent to the structure. The Contractor shall conduct cleaning operations to minimize the waste materials produced. Prior to beginning the work, the Contractor shall submit to the Engineer for acceptance, a detailed methods statement for capturing, testing, and disposing of the removed materials. The Engineer will have seven calendar days to review, and accept or reject this methods statement.
- (c) Abrasives utilized for blast cleaning shall be low-dusting and low waste. Unless approved otherwise, vacuum blasting or wheel blasting shall be used.
- (d) The HSO shall sample and test the waste material for lead, chromium, and other paint associated heavy metals using the Toxicity Characteristic Leaching Procedure (TCLP) Test, Method 1311 of the EPA publication, Test Methods for Evaluating Solid Waste 846. Sample collection methodology and frequency shall be recommended by the HSO and accepted by the Engineer with an adequate number of samples taken to be representative of all waste material collected. If the waste material does not pass the TCLP test, it shall be disposed of in a permitted TSD facility as designated in writing by the Engineer. The waste materials handling decision shall be documented by a report (five copies) submitted to the Engineer. This documentation shall include a description of sample collection methodology, testing performed, test results and comparison of test results with hazardous waste requirements. The waste material shall not be held at an unpermitted TSD facility site in excess of Resource Conservation and Recovery Act (RCRA) temporary storage time limits.
- (e) When an item coated with paint is removed, all loose paint shall be removed and collected from the item within 24 hours of the time it is removed or placed onto the ground. All loose paint shall be removed and collected from a painted item before it is removed from the site. The Contractor shall contain loose paint until it is removed and collected. Loose paint is defined as that which can be removed by manual scraping methods. Over waterways, the Contractor shall capture all paint debris by the method specified in the methods statement. The paint debris shall be collected on a daily basis and shall be stored in a properly labeled, tightly sealed container and placed in a secured location at the end of each working day.
- (f) All painted steel components which are not designated to be salvaged shall be recycled. Contractor possession of the steel for future use shall be considered a form of recycling. Prior to transport of the components off-site, the Contractor shall obtain a letter from the recipients of the painted steel components stating that they have been fully informed of the contents of the paint and are capable of handling the paint. If the Contractor is to maintain future possession of the steel, the Contractor shall supply this letter. If there will be more than one recipient of the painted material, one letter shall be obtained from each

recipient. The Contractor shall provide a copy of each letter to the Engineer. If the painted steel components will be recycled by melting, this letter is not required. The Contractor shall submit a letter stating the destination of the painted steel components and that they will be melted.

- (g) When the work consists of the removal of a bridge or components of a bridge coated with paint which has been assumed to contain lead, chromium, other heavy metals, or a combination thereof the Contractor shall capture paint debris which is dislodged during removal operations. The Contractor may choose any method for dismantling the bridge, subject to the following required construction sequence limitations:
 - (1) The concrete deck shall be removed prior to removal of the steel superstructure.
 - (2) If the methods statement indicates that girders will be dropped to the ground during dismantling, all debris from the concrete deck removal operation shall be removed from the area below the bridge before any girders are dropped into this area.
 - (3) Girders may be cut and dropped only if the span is located entirely over land.

250.05 Material Handling. This work consists of the additional handling of soils to be excavated for construction of the project which are suspected or known to be contaminated. This work also includes stockpiling or containerization, analytical sampling and testing, and final disposition of soils specially handled.

The Contractor shall maintain vertical trench walls for the work in the specified areas of known or potential contamination, as shown on the plans. Shoring may be necessary to meet this requirement. The Contractor shall confine the removal of contaminated soils in the specified areas to the vertical and horizontal limits of structure excavation specified in the Contract. The Contractor shall be responsible for any contaminated materials generated beyond the limits of excavation. This shall include any sampling, analysis, and disposal required, and the costs thereof. The Contractor shall be listed as the generator of any such material. The limits of excavation shall be determined as 18 inches outside of structures, including sewers, water lines, inlets, manholes, and other underground structures to be constructed, or as directed.

Specific areas of known or potential contamination have been identified in the project plans. There is the potential of encountering contaminated soil, which has not been summarized in the plans or specifications, at unknown locations on the site. Suspected contaminated soil will be handled by one of three methods as follows:

- (a) *Materials Handling (Stockpile).* When recommended by the HSO and authorized by the Engineer, material will be stockpiled for analysis and characterization for proper handling and, disposal, or both. Sampling and testing of materials shall be as described in the Contract. If analysis indicates that soil samples are designated as uncontaminated, as determined

by the criteria shown in the Contract or as determined by the CDPHE, the associated soils will not require any special handling and will become the property of the Contractor and may be used on site, subject to other requirements of the Contract. Health and safety monitoring and strict fugitive dust control shall be conducted during the placement of these soils.

Stockpiled materials shall be secured in compliance with the following provisions until they are determined to be uncontaminated:

1. The Contractor shall not store the material for more than 90 days.
 2. The Contractor shall prevent any runoff from infiltrating the ground or running out of the containment area.
 3. Soils containing different contaminants shall be placed in separate stockpiles.
 4. The Contractor shall prevent the dispersion of materials or the dilution or mixing of stockpiles.
 5. The ground surface on which the contaminated soils will be placed shall be covered with plastic sheeting which will withstand the placement and removal of stockpiled materials without breaching.
 6. The ground surface shall be graded to drain toward the edge of the soil piles and the berm or trench around them shall be covered by plastic sheeting.
 7. Proper security shall be provided in accordance with 40 CFR.
- (b) *Solid Waste Disposal.* Soils determined to be contaminated, but not hazardous, as established by criteria in the Contract or as determined by CDPHE or other regulatory agencies having jurisdiction, shall be handled and disposed of, or both as recommended by the HSO and approved by the Engineer. The Contractor shall haul this material to a solid waste disposal facility.
- (c) *Hazardous Waste Disposal.* Soils that are designated or suspected to be hazardous shall be containerized immediately upon excavation or upon discovery. Hazardous material shall be labeled and transported to a hazardous waste disposal facility designated by the Engineer.
- (d) *Additional Requirements.* Stockpiled or containerized material characterized as uncontaminated, contaminated or hazardous shall be stored and disposed of in a manner consistent with current established federal, state, and local regulations for waste materials.

Materials with contaminants not specifically regulated shall be disposed of by the Contractor as directed, in consultation with CDPHE. All areas where wastes are generated shall be reviewed by the HSO to identify potential contaminant sources that may result in a contaminated waste stream.

Contaminated soils, which have been identified as solid waste or hazardous waste, requiring disposal according to federal, state, and local regulations, shall be transported in accordance with 49 CFR by the Contractor to an

appropriately permitted landfill, incinerator or asphalt plant or other facility approved to accept the waste. CDPHE and the landfill or other treatment or disposal facility shall be notified by the HSO of the material to be disposed of and the corresponding analytical test results prior to shipment.

Potentially contaminated water collected from the lined trench of a stockpile shall be treated as required by Colorado Wastewater Discharge Permit System (CDPS) permits, 29 CFR and 40 CFR and reimbursed separately in accordance with Contract requirements.

250.06 Sample delivery. This work consists of the collection, containerization and delivery of material samples for analysis to the testing facility designated in the Contract.

Environmental Protection Agency (EPA) protocol and standards shall be followed in the collection, containerization and transport of samples to be analyzed, including the documentation of the proper chain of custody of all samples. The Contractor shall collect sufficient sample material to perform the required analysis and is responsible for ensuring that appropriate climate control has been provided for sample transport. Sample delivery shall be made within the maximum allowable holding time for each sample type, not to exceed 24 hours, excluding weekends. The time period required for sample collection and delivery to the testing facility will not be considered an excusable delay. The analysis to be completed and turnaround time shall be approved by the Engineer.

The Contractor shall provide the Engineer with a copy of documentation indicating that proper chain of custody requirements have been followed for all samples.

Quality control samples shall be provided by the Contractor in accordance with the quality control requirements of the testing facility designated in the Contract (quality control requirements are available from the Engineer). The Contractor shall prepare, label and transport these samples to the testing facility in conjunction with the delivery of other samples authorized for analysis by the Engineer, at no additional cost.

The Engineer may request splits of samples, in advance of collection, which shall be provided at no additional cost by the Contractor.

250.07 Asbestos-Containing Material Management. Environmental documents or plans listed in the special provisions should include known or suspected locations that could involve encounters with ACM during excavation and other soil disturbing construction activities. Unexpected discoveries of ACM may be made during excavation and soil disturbing construction activities. Asbestos contaminated soil, shall be properly managed or remediated, in accordance with subsection 250.07(a).

All asbestos related activities shall be performed by Colorado certified asbestos professionals, contractors, or consultants. Certifications are issued by the Colorado Department of Public Health and Environment (CDPHE), Indoor Air Quality Unit. A Colorado Certified Asbestos professional shall manage the management and

disposal of asbestos contaminated soil and other ACM. The Indoor Air Quality Unit within CDPHE is the only unit that certifies such professionals. The Contactor shall furnish a copy of the license to the Engineer.

- (a) *Regulatory Compliance.* Asbestos contaminated soil management is governed by 6 CCR 1007-2, Section 5, which includes and references regulatory compliance with Asbestos Hazard Emergency Response Act (AHERA) Colorado Regulation 8; Inspection and reporting protocol and demolition standards are governed by AHERA; Demolition and notification standards are governed by National Emission Standards for Hazardous Air Pollutants (NESHAPS); Colorado Regulation 8 governs all asbestos activities, demolition, permitting, and certification of Certified Asbestos Professionals in the State of Colorado. Colorado Regulation 8 is more stringent than AHERA and NESHAPS and supersedes federal regulations. Conflicting regulatory requirements between AHERA and NESHAPS, if not specifically addressed in Colorado Regulation 8, shall be addressed and approved protocol negotiated with CDPHE.

The Contractor shall conform to all current regulations, policy directives, or both, issued by the EPA, CDPHE, and the Department.

- (b) *Asbestos Management and Visual Inspections* Asbestos management must be performed by a certified asbestos professional. Final Inspections of the area of asbestos contaminated soil removal shall be performed by an Asbestos Consultant to determine what, if any, controls must be instituted to allow future activity in the excavation area. All final visual inspections shall be conducted only when soil is dry.
- (c) *Permitting and Notification.* The CDPHE requires notification of any soil disturbing activity where asbestos is known, suspected, or discovered. A 24-hour notification to CDPHE is required prior to any soil disturbing activity of an unplanned asbestos discovery. A 10 working day notification to CDPHE is required prior to any soil disturbing activity in an area with known or potential material suspected of containing asbestos in or on the soil or asbestos-contaminated soil. Removal of asbestos-containing material on a facility component, that is located on or in soil that will be disturbed, with asbestos quantities above the following trigger levels must be permitted and abated in accordance with the requirements of Air Quality Control Commission Regulation No. 8 (5 CCR 1001-10, Part B):
- (1) 260 linear feet on pipes,
 - (2) 160 square feet on other surfaces, or
 - (3) The volume of a 55-gallon drum.

All permit applications shall be submitted to the Colorado Department of Public Health and Environment a minimum of 10 days prior to start of work for approval. The permit application and notification shall be submitted simultaneously. The Contractor shall obtain all required State and local permits and shall be responsible for all associated fees.

Permit application, notification, and waiver request forms shall be submitted to:

Colorado Department of Public Health and Environment
 Permit Coordinator/APCD - SS - B1
 4300 Cherry Creek Drive South
 Denver, CO 80246-1530
 Phone: (303) 692-3100
 Fax: (303) 782-0278

Application and waiver forms are available on the CDPHE website:
asbestos@state.co.us

- (d) *CDPHE's Asbestos-Contaminated Soil Guidance Document or the State of Colorado's Asbestos Contaminated Soil Statewide Management Plan (ACS)*. Asbestos contaminated soil shall be managed in accordance with 6 CCR 1007-2, Section 5, Asbestos Waste Management Regulations. Regulations apply only upon discovery of asbestos materials during excavation and soil disturbing activities on construction projects, or when asbestos encounters are expected during construction. The contractor shall comply with procedures detailed in the CDPHE's Asbestos-Contaminated Soil Guidance Document or the State of Colorado's Asbestos Contaminated Soil Statewide Management Plan, whichever is more recent at the time of advertisement, including the following minimum requirements:
- (1) Immediate actions and implementation of interim controls to prevent visible emissions, exposure, and asbestos contamination in surrounding areas.
 - (2) Soil Characterization.
 - (3) Training required for all personnel involved in excavation and other soil disturbing activities, once asbestos is encountered during construction or on projects where asbestos encounters are expected. Training must be given by a Certified Asbestos Inspector or Certified Asbestos Abatement Designer with a minimum of six months experience inspecting asbestos contaminated soil.
 - (4) Assessment for the presence and extent, within the proposed area of disturbance, of asbestos discoveries, whether expected or unexpected, by a Certified Asbestos Inspector.
 - (5) Investigation and sampling required for risk assessment and management. Investigation, if required, shall be conducted by a Certified Asbestos Inspector.
 - (6) Risk assessment and determinations for further management or abatement.
 - (i) Risk assessment and determinations must be made by a Certified Asbestos Inspector, and coordinated with the Engineer.
 - (ii) Soil remediation is not necessarily required, depending on the circumstances.

- (7) Submit 24-hour Notification of Unplanned Asbestos Discovery.
- (8) Submit 10-day Notification of Planned Asbestos Management.
- (e) *Risk Assessment and Determinations for Further Management Or Remediation.* Risk assessment and determinations for further management or remediation must be closely coordinated with the Project Engineer and Project Manager of the Statewide Management Plan.

250.08 Methamphetamine Lab Sites. Demolition of former Methamphetamine (meth) labs is enforced by the Governing Authority, which varies from county to county. The Contractor shall demolish all buildings that are identified as former meth labs, as listed in public listings by the Governing Authority. The Contractor shall provide evidence of demolition to the Governing Authority, obtain receipt of such evidence by the Governing Authority, and shall submit these to Engineer immediately following demolition.

Septic tank removal at known meth lab sites shall undergo preliminary assessment by an Industrial Hygienist or Certified Industrial Hygienist to determine proper removal and disposal. Work shall proceed in accordance with the recommendations of the Hygienist.

METHOD OF MEASUREMENT

250.09 Environmental Health and Safety Management will not be measured, but will be paid for on a lump sum basis. This will include all work, materials, and hourly time charges by the HSO and other personnel required to accomplish the following:

- (1) Preparation and briefing of the initial HASP
- (2) Procedures and equipment specified in subsections 250.03 - 250.07
- (3) PPE (levels C and D) for Contractor's personnel for any contamination identified in the preconstruction investigations
- (4) Preparation and submittal of the final site report

The quantity to be measured for Health and Safety Officer will be the total number of hours that the Health and Safety Officer is actually used, as authorized, for the following work:

- (1) Field monitoring necessary to ensure the safety of workers on the site;
- (2) Hours in excess of the items listed under Environmental Health and Safety Management;
- (3) Hours that are necessary due to unforeseen site conditions; and
- (4) Hours of additional consultation or field work that is requested by the Engineer.

Equipment specified in subsection 250.03(a), preparation and submittal of the daily HSO diary, travel to and from the project site, and PPE (Levels C and D) required for use by the HSO will not be measured and paid for separately, but shall be included in the hourly cost of the HSO.

The quantity to be measured for Monitoring Technician will be the total number of hours that Monitoring Technician is actually used as authorized. Equipment specified in subsection 250.03(b), supervision of the MT, preparation and submittal of the daily monitoring diary, travel to and from the project site, and PPE required for use by the MT (Levels C & D) will not be measured and paid for separately, but shall be included in the hourly cost of the MT.

Materials stockpiled under the requirements of this specification will be measured by the cubic yard computed from cross sections by the average end area or other acceptable method. Disposal of solid waste and hazardous waste materials will be measured by the cubic yard in the disposal container.

Materials Sampling and Delivery will be measured by the actual number of samples collected, containerized and transported to the testing facility indicated in the Contract.

Additional environmental health and safety management work required and authorized by the Engineer, but not included in the items listed above, will be considered extra work to be paid for in accordance with subsection 109.04, unless such work is caused by the Contractor's action.

BASIS OF PAYMENT

250.10 Partial payment for Environmental Health and Safety Management, as determined by the Engineer, will be made as the work progresses. The Contractor shall submit a schedule of environmental related Health and Safety Management work before the first partial payment is made. The schedule shall indicate the environmental related Health and Safety Management time for each work item that requires Contractor environmental related Health and Safety Management effort and the total time for the project.

The accepted quantity for Health and Safety Officer will be the number of hours actually used and approved for payment by the Engineer and will be paid for at the contract unit bid price.

The accepted quantity for Monitoring Technician will be the number of hours of on site monitoring as approved by the Engineer and will be paid at the Contract unit price.

Environmental Health and Safety Management, Health and Safety Officer and Monitoring Technician bid items shall include vehicles, phone charges, supplies, printing, postage, office support, and all other miscellaneous costs associated with the work.

Payment for Materials Handling (Stockpile) will be made at the contract unit price for all excavated material required to be stockpiled for analysis. The contract unit price will be full compensation for furnishing all materials, labor, equipment and incidentals necessary to complete this work, and all handling of the material prior to disposal. This includes haul, stockpile, water collection, and security. Payment for this work will be in addition to any payment made under other bid items for excavation, embankment or backfill on the project, or waste disposal of this material.

Payment for Solid Waste Disposal and Hazardous Waste Disposal will be made at the appropriate contract unit price for the disposal of material determined to be either solid waste or hazardous waste. The contract unit prices will be full compensation for furnishing all materials, labor, equipment, tools, storage containers for transport, containerization of material for up to 60 days, and incidentals necessary to complete this work. This includes all handling of the material, loading for disposal, unloading for disposal, and borrow material required for replacement of excavated material disposed of off site. It does not include stockpiling required for analysis which is included in the item Materials Handling (Stockpile) paid for as described above. Payment for waste disposal fees and transport of hazardous waste will be made as shown below. Payment for this work will be in addition to any payment made under other bid items for excavation, embankment, backfill or material handling (stockpile) on the project.

- (1) *Solid Waste Disposal.* Transport costs to the disposal facility and disposal fees will be included in the contract unit price for this work.
- (2) *Hazardous Waste Disposal.* Transport costs to the disposal facility and disposal fees will be paid for in accordance with subsection 109.04

The cost of shoring required to limit the removal of contaminated materials to the specified limits shall be included in the bid unit prices for any excavation to be performed. Such shoring ordered by the Engineer in areas other than the specified areas of known or potential contamination, as shown in the plans, will be paid for in accordance with subsection 109.04.

Payment for Materials Sampling and Delivery will be made at the contract unit price for each material sample collected, containerized and transported to the laboratory testing facility as designated in the Contract. The Contract unit price will be full compensation for furnishing all materials, labor, equipment, tools and incidentals necessary to complete this work including required sampling kits, containers, sample splits and quality control samples.

The Contractor shall be responsible for damage caused by construction operations to the environment, persons, or property. Expenditures associated with actions of the Contractor shall be borne by the Contractor at no cost to the project.

The accepted quantities will be paid for at the contract unit price for each of the pay items listed below that appear in the bid schedule.

Payment will be made under:

Pay Item	Pay Unit
Environmental Health and Safety Management	Lump Sum
Health and Safety Officer	Hour
Monitoring Technician	Hour
Materials Sampling and Delivery	Each
Materials Handling (Stockpile)	Cubic Yard
Solid Waste Disposal	Cubic Yard
Hazardous Waste Disposal	Cubic Yard

SECTION 506 RIPRAP

DESCRIPTION

506.01 This work consists of the construction of riprap in accordance with these specifications and in conformity with the lines and grades shown on the plans or established.

MATERIALS

506.02 Riprap shall consist of hard, dense, durable stone, angular in shape and resistant to weathering. Rounded stone or boulders shall not be used as riprap material. The stone shall have a specific gravity of at least 2.5. Each piece shall have its greatest dimension not greater than three times its least dimension.

Material used for riprap may be approved by the Engineer if, by visual inspection, the rock is determined to be sound and durable. The Engineer may require the Contractor to furnish laboratory results if, in the Engineer's opinion, the material is marginal or unacceptable. At the request of the Engineer, the Contractor shall furnish laboratory test results indicating that the material meets the requirements for abrasion resistance or compressive strength as indicated in Table 506-1.

Table 506-1

Test Description	Test Method	Specification Requirement
Abrasion Resistance by Los Angeles Machine	ASTM C 535	50% Loss, max.
Unconfined Compressive Strength of Drilled Core Specimen	AASHTO T 24	2500 psi, min.

Riprap shall conform to the gradation requirements given in Table 506-2.

Table 506-2

Pay Item		Percent of Material Smaller Than Typical Stone ²	Typical Stone Dimensions ³ (Inches)	Typical Stone Weight ⁴ (Pounds)
	Stone Size d50 ¹ (Inches)			
Riprap	6	70-100	12	85
		50-70	9	35
		35-50	6	10
		2-10	2	0.4
Riprap	9	70-100	15	160
		50-70	12	85
		35-50	9	35
		2-10	3	1.3
Riprap	12	70-100	21	440
		50-70	18	275
		35-50	12	85
		2-10	4	3
Riprap	18	100	30	1280
		50-70	24	650
		35-50	18	275
		2-10	6	10
Riprap	24	100	42	3500
		50-70	33	1700
		35-50	24	650
		2-10	9	35

¹d50 = nominal stone size
²based on typical rock mass
³equivalent spherical diameter
⁴based on a specific gravity = 2.5

Nominal stone size and total thickness of the riprap shall be as shown on the plans.

Control of gradation will be by visual inspection. The Contractor shall provide two samples of rock at least 5 tons each, meeting the gradation specified. One sample shall be provided at the construction site and may be a part of the finished riprap covering. The other sample shall be provided at the quarry.

These samples will be used as a reference for judging the gradation of the riprap supplied. When it is determined necessary, conformance of the gradation will be verified by dumping and checking the gradation of two random truck loads of stone. Mechanical equipment, a sorting site, and labor needed to assist in checking gradation shall be provided at the Contractor's expense.

CONSTRUCTION REQUIREMENTS

506.03 Stones with typical stone dimensions that are equal to d50 and larger shall be placed at the top surface with faces and shapes matched to minimize voids and form as smooth a surface as practical. Dumping and backhoe placement alone is not sufficient to ensure a properly interlocked system. The material may be machine-placed and then arranged as necessary by use of an excavator with a multi-prong grappling device or by hand to interlock and form a substantial bond.

Excavation for toe or cut-off walls shall be made to the neat lines of the wall. Allowance will not be made for work outside the neat lines.

METHOD OF MEASUREMENT

506.04 Riprap of the sizes specified in the Contract will be measured by the ton or by the cubic yard. Cubic yards will be by the method of average end areas based on dimensions shown on the plans or ordered.

BASIS OF PAYMENT

506.05 The accepted quantities of riprap will be paid for at the contract unit price per cubic yard or per ton.

Payment will be made under:

Pay Item	Pay Unit
Riprap (___inch)	Cubic Yard or Ton

Structure excavation will be measured and paid for in accordance with Section 206.

RIPRAP (GABIONS) AND SLOPE MATTRESS

DESCRIPTION

506.06 This work consists of the construction of riprap in wire mesh gabions and in wire mesh slope mattresses in accordance with these specifications and in conformity with the lines and grades shown on the plans or established.

MATERIALS

506.07 The wire, wire mesh, cages, anchor stakes and riprap shall conform to subsection 712.09.

CONSTRUCTION REQUIREMENTS

506.08 Gabions and Slope Mattresses. Gabions and slope mattresses shall be placed to conform to the plan details. Riprap material shall be placed in close contact in the unit so that maximum fill is obtained. The units may be filled by machine with sufficient hand work to accomplish requirements of this specification.

Where the length of the unit exceeds its horizontal width the gabion is to be equally divided by diaphragms, of the same mesh and gauge as the body, into cells whose length does not exceed the horizontal width. The unit shall be furnished with the necessary diaphragms secured in proper position on the base section in such a manner that no additional tying at this juncture will be necessary.

- (a) *Gabions.* All perimeter edges of gabions are to be securely selvaged or bound so that the joints formed by tying the selvages have approximately the same strength as the body of the mesh.

The gabion bed shall be excavated to the width, line, and grade as staked by the Engineer. The gabions shall be founded on this bed and laid to the lines and dimensions required.

Excavation for toe or cut-off walls shall be made to the neat lines of the wall.

All gabion units shall be tied together each to its neighbor along all contacting edges in order to form a continuous connecting structure.

- (b) *Slope Mattresses.* Slope mattresses shall be filled with angular or fractured stone. Rounded boulders will not be permitted. Before the mattress units are filled, the longitudinal and lateral edge surfaces of adjoining units shall be tightly connected by means of wire ties placed every 4 inches or by a spiral tie having a complete loop every 4 inches. The lid edges of each unit shall be connected in a similar manner to adjacent units. The slope mattress shall be anchored as shown on the plans.

The Contractor shall determine whether the holes for the soil anchor stakes are to be drilled or whether the stakes may be driven. Care shall be taken to avoid drilling holes to a greater depth than is necessary to place the top of the finished stake slightly above the top of the finished mattress.

The Contractor will be allowed to assemble, partially fill, and tie together mattress-units on the subgrade provided they can be placed on the slope without abrading the zinc coating on the wire mattress or permanently distorting the shape of the mattress in transporting and installing the units on the slope. All prefabrication procedures shall be subject to approval.

METHOD OF MEASUREMENT

506.09 The quantity to be measured under this item will be the number of cubic yards of riprap required to fill the gabions and slope mattresses in accordance with the dimensions shown on the plans, or ordered.

BASIS OF PAYMENT

506.10 The accepted quantity measured as provided above will be paid for at the contract unit price per cubic yard for “Riprap (Gabions)” or “Slope Mattress” as the case may be.

506.10

Payment will be made under:

Pay Item	Pay Unit
Riprap (Gabions)	Cubic Yard
Slope Mattress	Cubic Yard

Structure excavation and structure backfill will be measured and paid for in accordance with Section 206.

SECTION 604 MANHOLES, INLETS, AND METER VAULTS

DESCRIPTION

604.01 This work consists of the construction of manholes, inlets, and meter vaults in accordance with these specifications, and in conformity with the lines and grades shown on the plans or established.

MATERIALS

604.02 Concrete for these structures shall meet the requirements of Section 601-Structural Concrete.

Other materials shall meet the requirements specified in the following subsections:

Clay or Shale Brick	704.01
Concrete Brick	704.02
Concrete Masonry Blocks	704.03
Frames, Grates, Covers, and Steps	712.06
Grade Ring	712.05
Reinforcing Steel	709.01
Precast Concrete Units	712.05

CONSTRUCTION REQUIREMENTS

604.03 Excavation. Excavation shall be in accordance with the requirements of Section 206.

604.04 Manholes, Inlets, and Meter Vaults.

- (a) *General.* Concrete construction shall conform to the requirements of Section 601. Masonry shall conform to the requirements for the respective type. When specified, the outside face of structures shall be plastered with a ½ inch thick cement-sand mortar coat. Unless otherwise provided, exposed surfaces of concrete and masonry shall be cured as defined in subsection 601.13.

Pipe sections on the inside of manholes or inlets shall be treated as shown on the plans, or as directed, and shall project outside sufficiently for proper connection with next pipe section. Masonry shall fit neatly and tightly around the pipe.

- (b) *Manholes.* Wherever directed by the Engineer, pipes of the proper type and size shall be built into a manhole where future laterals are to be connected. These pipes shall be sealed at their outer ends and an invert shall be built into each manhole for such lateral connections.

When a manhole is located in the pavement area, it shall not be constructed to final grade until the pavement has been completed.

- (c) *Inlets.* Where inlets are placed in existing curbs or gutters, the Contractor shall carefully remove sections of present curb, gutter, or curb and gutter. All damage to sections to remain in place shall be repaired at the Contractor's expense. The top portion of inlets shall be constructed concurrently with the adjacent curb and gutter to insure proper alignment of grades unless otherwise permitted in writing.
- (d) *Meter Vaults.* Meter vaults shall be of sufficient size to properly accommodate the size of the meter installed including regulatory devices or fittings required for the utility supplied. Provisions for grounding, ventilation, drainage or other safety precautions shall be constructed as required. Meter vaults may be cast-in-place or precast and shall conform to the rules and regulations for the utility service supplied in the vault.
- (e) *Brick Masonry.* All bricks shall be thoroughly wetted, before being laid, either by immersion or in a manner satisfactory to the Engineer.

Special care shall be taken to make the face of the brick work smooth. All joints on the interior surface of the manholes and appurtenances shall be carefully struck.

Brick shall not be laid upon a concrete foundation until the concrete has set.

604.05 Backfilling. Unless otherwise directed, all excavations shall be backfilled immediately after the structures are built. Backfilling shall conform with Section 206 and as shown on the plans.

Resurfacing. Excavations in existing streets, except streets which are to be closed or abandoned, shall be resurfaced as soon as practicable with the type and thickness of bases and pavement shown on the plans or as designated.

Cleaning. The structures and all appurtenances shall be thoroughly cleaned before final acceptance of the work.

When the new facilities interfere with the existing flow of sewage, the Contractor shall provide satisfactory bypass facilities at the Contractor's expense.

METHOD OF MEASUREMENT

604.06 Manholes and inlets will be measured by the complete unit including ring and cover or grating and frame.

Manhole ring and cover used separately will be measured by the unit.

Inlet grating and frame used separately will be measured by the unit.

Manhole and inlet depth, "H," will be measured as shown on the plans. Measured depth and pay depth of manholes and inlets shall conform to the following:

604.06

Measured Depth	Pay Depth
0.0 to 5.0 feet	5 feet
5.1 to 10.0 feet	10 feet
10.1 to 15.0 feet	15 feet

(continued thus)

Meter vaults will be measured by the complete unit including ring and cover.

Structure excavation and structure backfill for manholes, inlets, and meter vaults will not be measured and paid for separately but shall be included in the work.

BASIS OF PAYMENT

604.07 The accepted quantities will be paid for at the contract unit price for each of the pay items listed below that appear in the bid schedule. Except as otherwise indicated on the plans or in the special provisions, all connecting devices will not be measured and paid for separately but shall be included in the work.

Payment will be made under:

Pay Item	Pay Unit
Meter Vault	Each
Manhole _____ (_____)	Each
Inlet, Type _____ (_____Foot)	Each
Manhole Ring and Cover	Each
____ Inlet Grating and Frame	Each

SECTION 607 FENCES

DESCRIPTION

607.01 This work consists of the construction of fence and gates, and removal of temporary plastic fence in accordance with these specifications and in conformity with the lines and grades shown on the plans or established.

MATERIALS

607.02 Materials shall meet the requirements specified in the following subsections:

Woven Wire	710.02
Barbed Wire	710.01
Chain Link Fabric	710.03
Fence Posts	710.07
Snow Fence	710.04
Timber for Wood Sound Barrier	710.06

Reinforcing steel shall conform to Section 602.

Concrete shall conform to Section 601.

Foundation concrete for fence posts, braces, anchors and gates shall be Class B. Concrete with lightweight aggregates conforming to ASTM C 330 will be permitted. Field mixed concrete consisting of a minimum of one part cement to six parts of aggregate by volume may be used in lieu of Class B if approved. Pre-packaged concrete may be used if approved.

Fence (Plastic) shall be orange colored material, at least 4 feet in height.

CONSTRUCTION REQUIREMENTS

607.03 The Contractor shall perform such clearing and grubbing as may be necessary to construct the fence to the required grade and alignment.

Right of Way fence shall be constructed approximately 6 inches inside the boundary of the highway right of way shown on the plans or as staked. Anchorages, footings or fence appurtenances shall not extend beyond the limits of the highway right of way without the written consent of the abutting property owner.

At locations where breaks in a run of fencing are required, at intersections with existing fences, or at ditch, canal, or channel crossings, appropriate adjustments in fence alignment and post spacing shall be made to satisfy the requirements for the type of closure indicated or the conditions encountered.

When the plans require that posts, braces or anchors be embedded in concrete, they shall be securely braced to hold the posts in proper position until such time as the concrete has set sufficiently to hold the posts. Unless otherwise permitted, materials shall not be installed on posts, or stress placed on guys and bracing set in concrete until the concrete has set sufficiently to withstand the stress.

The tops of all posts shall be set to the required grade and alignment. Cutting of the tops or bottoms of treated timber posts will be allowed only with the approval of the Engineer. Posts cut in the field shall have the cut surfaces protected with two coats of an approved wood preservative.

Wire or fencing of the size and type required shall be firmly attached to the posts and braces in the manner indicated. All wire shall be stretched taut and be installed to the required spacing.

Wood sound barrier fence shall be constructed according to the details shown on the plans. All fence boards shall be tightly butted to minimize cracks.

Fence (Plastic) shall be placed as shown on the plans or as directed to define the limits of the work area beyond which no access is allowed to the surrounding wetlands or vegetation to be protected.

METHOD OF MEASUREMENT

607.04 Fence will be measured by the linear foot. Measurement will be along the base of the fence from outside to outside of end posts for each continuous run of fence including length of barbed wire gates, but excluding the length of driveway gates and walk gates.

Driveway gates and walk gates will be measured as complete units of the size and type specified. Gates shall be the same type and height as the adjacent fence unless otherwise designated.

End posts, corner posts and line brace posts required for chain link fence, barbed wire and combination wire fence will be measured by the actual number used.

End posts, corner posts and line brace posts for snow fence or barrier fence will not be measured and paid for separately but shall be included in the work.

Line posts required for reset fence will be measured by the actual number used.

Line posts required for new fence will not be measured separately, but shall be included in the contract unit price for new fence.

End Posts Special, Corner Posts Special, and Line Brace Posts Special required for Fence (Deer) will be measured by the actual number used.

Fence Wood (Sound Barrier) will be measured by the linear foot.

Fence (Plastic) will be measured by the linear foot. Posts will not be measured and paid for separately, but shall be included in the work.

Measurement will be along the base of the fence from outside to outside of end posts for each continuous run of fence, and shall include all wood, hardware, concrete, reinforcing steel, excavation and backfill, and all other incidentals to the erection of the fence.

BASIS OF PAYMENT

607.05 The accepted quantities of fence will be paid for at the contract unit price for each of the pay items listed below that appear in the bid schedule.

Payment will be made under:

Pay Item	Pay Unit
Fence (____) (____Inch)	Linear Foot
(____Foot) Gate (____)	Each
Line Post	Each
End Post	Each
Corner and Line Brace Post	Each
End Post (Chain Link)	Each
Corner and Line Brace Post (Chain Link)	Each
End Post Special	Each
Corner and Line Brace Post Special	Each
Deer Gate	Each
Fence Wood (Sound Barrier) (____Inch)	Linear Foot
Fence (Plastic)	Linear Foot

Payment for Fence (Plastic) shall be full compensation for furnishing, erecting, maintaining, removing, and disposing of all materials required. Fence (Plastic) shall remain the property of the Contractor.

DIVISION 1
GENERAL REQUIREMENTS

PART 1 – GENERAL

1.1 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Contract generally includes approximately 2000 linear feet of 48" RCP and 54" HDPE, with a section requiring bore under I70, new effluent box, removal and abandonment of the existing effluent outfall, and a new diffuser outfall in the Colorado River. Not every detail is shown in the Drawings or described in the Specifications. Minor additional work items shall be included in the Contractors Bid Price and it is expressly agreed that this work will be performed with no claim for additional cost.
- B. The CONTRACTOR is responsible for security on the Project until Substantial Completion of the Project.

1.2 DOCUMENTS

- A. Drawings and Specifications
 - 1. Do not scale Drawings.
 - 2. Take all dimensions and measurements from actual equipment to be furnished. All dimensions and measurements must be verified in the field. Actual locations, distances, and elevations will be governed by actual field conditions. CONTRACTOR shall be responsible for all measurements taken in the field.
 - 3. This Project Manual is prepared using the Construction Specification Institute (CSI) basic concepts and techniques and shall be so interpreted. Each section is divided into three parts wherever applicable in accordance with the guidelines established by the CSI format for construction specifications.

1.3 DELIVERY & RECEIPT OF EQUIPMENT AND MATERIALS

- A. CONTRACTOR is responsible for the delivery, receipt, storage, protection and use of equipment and materials in conjunction with this Project. OWNER will not receive or take any responsibility for equipment and materials delivered to the site.

1.4 NOTICE TO OWNERS AND AGENCIES

- A. Give notification sufficiently in advance to enable affected persons to provide for their needs when necessary.
- B. Contact utilities and other concerned agencies at least 48 hours, exclusive of weekends and holidays, prior to excavating near

underground utilities or pole lines, or performing Work which may affect them.

- C. Names of affected agencies and utilities in the area are listed below for CONTRACTOR's convenience.

UTILITIES

Water:	City of Grand Junction
Sanitary Sewer:	City of Grand Junction
Storm Sewer:	City of Grand Junction
Electric:	Excel Energy
Gas:	Excel Energy
Telephone:	Century Link
Roads:	CDOT/City of Grand Junction

AGENCIES

Fire:	EMERGENCY - 911
Police:	EMERGENCY - 911
Ambulance:	EMERGENCY - 911

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

PART 1 – GENERAL

1.1 NEED FOR CONTINUOUS OPERATION

- A. The existing wastewater treatment plant is operated by the OWNER. Throughout the construction period, the facility shall not be interrupted. Any interruption of the operation shall be approved and coordinated by the OWNER.
 - 1. Provide temporary facilities and make temporary modifications as required (and as satisfactory to OWNER) to keep the existing facilities in operation throughout the construction period.
 - 2. It is anticipated that flows from the plant will be able to be shut off for a short duration (less than 12 hours) for final connection to the existing system
- B. CONTRACTOR shall assume the responsibility for maintenance of all access roads as required for completion of the Work including, but not limited to snow plowing, grading, and temporary gravel surfacing.
- C. Construction activities shall not encumber or prevent access, by the OWNER, to the existing facilities and to the project site.
- D. The OWNER will maintain the operation of the existing treatment facilities.

1.2 ACCESS

- A. CONTRACTOR shall assume complete responsibility for the maintenance of all access roads as required for completion of the Work including, but not limited, to snow plowing, grading, and temporary gravel surfacing.
- B. Construction activities shall not encumber or prevent access, by the OWNER, to the existing wastewater treatment facility.

1.3 COORDINATION

- A. CONTRACTOR shall be responsible for performing the Work necessary to set up any temporary works generally described by this Specification. The OWNER shall be responsible for operating the existing treatment facilities during the construction period. CONTRACTOR shall provide advance notice to the OWNER of any construction activities that may affect operation of the treatment facility.

1.4 CONNECTION TO EXISTING FACILITIES

- A. Unless otherwise specified or indicated, CONTRACTOR shall make all necessary connections to existing facilities including structures, drain lines and utilities.
 - 1. Obtain permission from OWNER or the owning utility prior to undertaking connections.
 - 2. Provide at least 72 hours advance notification.
 - 3. Protect facilities from deleterious substances and damage.

- B. Plan connections to existing facilities which are in service thoroughly in advance. All required equipment, materials, and labor shall be on hand prior to undertaking the connections.

- C. The CONTRACTOR is ultimately responsible for locating all underground utilities that may be affected prior to excavating.

- D. Utility Service Outages
 - 1. Any work requiring service outages will be required to be coordinated between the CONTRACTOR and OWNER prior to the outage.

1.5 WORK SEQUENCE

- A. CONTRACTOR is to determine his own sequence of activities, except as required in these Specifications.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

1.1 GENERAL

DESCRIPTION OF CONTRACT BREAKDOWN

The work performed under this Agreement shall be paid for on a Unit Price basis and Lump Sum basis for individual line items at the rates for the respective items on the Bid Schedule. The quantities provided on the Bid Schedule are only estimates of the actual quantities of the work to be performed, and are only included for purposes of making the award and establishing a basis for estimating the probable cost of the Work. The actual amounts of work performed and materials furnished for unit price bid items may differ from the estimated quantities. The basis of payment for work and materials bid as a unit price will be the actual amount of approved work done and materials furnished. The CONTRACTOR agrees that he will make no claim for damages, anticipated profits, or otherwise on account of any difference between the amounts of work actually performed and materials actually furnished and the estimated amount for bid items.

Payment shall be made only for those items included in the Bid Schedule. All costs incurred shall comply with the provisions of these Specifications and shall be included in the unit price bid for the associated items in the Bid Schedule. Except as may be otherwise stipulated; no material, labor or equipment will be furnished by the OWNER. The quantity of work which will be considered for payment is the actual number of units completed in accordance with all relative Specifications. This basis of measurement and payment for each proposal item will be described below. The following provides a general listing of contract bid items along with a brief summary of the work and materials included, but not limited to, in the unit price, time and materials, or lump sum price for each bid item. Refer to the Specifications and Drawings for additional information.

1.2 SCOPE OF WORK

The Total Base Bid price shall cover all Work required by the Contract Documents. All costs in connection with the proper and successful completion of the Work, including furnishing all materials, equipment, supplies, and appurtenances; providing all construction plant, equipment, and tools; performing all necessary labor and supervision to fully complete the Work in accordance with the Drawings and these Specifications and Contract Documents, shall be included in the prices Bid.

1.3 BID ITEM DESCRIPTIONS

1) Clearing and Grubbing

No measurement for payment shall be made for any of the work, materials, and equipment required for clearing and grubbing. The lump sum (LS) bid price shall include all of the CONTRACTOR's costs of whatsoever nature including labor, material, and any incidental work and equipment necessary for clearing, grubbing, removing, and disposing of vegetation and debris within limits of the project footprint and temporary easement. The unit price shall include, but not be limited to all costs for materials, labor, and any other miscellaneous items and work shown or reasonably implied on the Drawings and in the Specifications for this work, and elsewhere in the Contract Documents.

<u>Pay Item</u>	<u>Pay Unit</u>
Clearing and Grubbing	LS

2) Remove and Replace Fence

This unit price per linear foot (LF) item shall be measured for payment along the fence and shall be continuous between fence posts. Removal and replacement shall leave space for a new dual gate at the west side of Persigo Wastewater Treatment Plant to facilitate future access. Removal and replacement on the east side of the plant shall be as needed to remove the existing effluent headwall and piping.

<u>Pay Item</u>	<u>Pay Unit</u>
Remove and Replace Fence	LF

3) Erosion/Sediment Control

Payment shall be made as the work progresses. Payment shall be made based on the actual number of erosion control features installed and inspected. All maintenance of BMP's shall be included in the cost of the installed BMP.

Silt fence, erosion logs, temporary berms, and temporary slope drains, will be measured by the actual number of linear feet that are installed and accepted.

Soil lifts will be measured by the actual number of linear feet (LF) (3' Height) that are installed and accepted

Storm drain inlet protection will be measured by the linear foot (LF) of storm drain inlet protection device installed and accepted.

Sediment trap quantities will be measured by the actual number installed and accepted. (EA)

Removal of trash that is not generated by construction activities will not be measured but is considered incidental to the project (See Special Condition 3.3.20).

Concrete washout structure will be measured by the actual number of structures that are installed and accepted. (EA)

Vehicle tracking pads will be measured by the actual number constructed and accepted. (EA)

Erosion Control Management (ECM) will not be measured. The lump sum (LS) bid price shall include all of the CONTRACTOR's costs of whatsoever nature including labor, material, and any incidental work and equipment necessary for the work. The ECS is required to be on the project performing the duties outlined in CDOT subsection 208.03(c).

Temporary Diversion (Coffer Dam) will be measured by the linear foot (LF) at the centerline of the Coffer Dam installed and accepted.

Temporary Stream Crossing (Persigo) will not be measured. The lump sum (LS) bid price shall include all of the CONTRACTOR's costs of whatsoever nature including labor, material, and any incidental work and equipment necessary to construct the temporary crossing of Persigo Wash. The unit price shall include, but not be limited to all costs for materials, excavation, bedding, backfill and compaction, pipe, reinforcement, protective wraps, removal of all materials, restoration, and any other miscellaneous items and work shown or reasonably implied on the Drawings and in the Specifications for this work, and elsewhere in the Contract Documents.

Seeding, Soil Conditioning, and Mulching (Hydraulic) will be measured by the total acreage (AC) installed and accepted.

Landscape Maintenance will not be measured. The lump sum (LS) bid price shall include all of the CONTRACTOR's costs of whatsoever nature including labor, material, and any incidental work and equipment necessary to maintain and restore the site to natural conditions. The unit price shall include, but not be limited to all costs for materials, excavation, bedding, backfill and compaction, additional seed, protective wraps, removal of all materials, restoration, and any other miscellaneous items and work shown or reasonably implied on the Drawings and in the Specifications for this work, and elsewhere in the Contract Documents for a one (1) year duration.

See Section 01563 and Sheets C101, and C503 to C506, and CDOT Section 208 for additional detail.

<u>Pay Item</u>	<u>Pay Unit</u>
Topsoil	CY
Stockpile Topsoil	CY
Silt Fence	LF
Erosion Log Type 1 (20 Inch)	LF
Temporary Berms	LF
Soil Lifts (3' High)	LF
Storm Drain Inlet Protection (Type 1)	LF
Sediment Trap	EA
Pre-fabricated Concrete Washout Structure	EA
Vehicle Tracking Pad	EA
Erosion Control Management (ECM)	LS
Temporary Diversion (Coffer Dam)	LF
Temporary Stream Crossing (Persigo)	LS
Seeding (Native)	AC
Soil Conditioning	AC
Mulching (Hydraulic)	AC
Landscape Maintenance	LS

4) Riprap (D₅₀ = 9 inches)

This unit price per cubic yard (CY) item shall be measured for payment based on the dimensions provided in the plans as installed. The bid price shall include all of the CONTRACTOR's costs of whatsoever nature including labor, material, and any incidental work and equipment necessary to install and compact the riprap. The unit price shall include, but not be limited to all costs for materials, excavation, bedding and soil retention blanket, backfill and compaction, removal of all materials, restoration, and any other miscellaneous items and work shown or reasonably implied on the Drawings and in the Specifications for this work, and elsewhere in the Contract Documents.

<u>Pay Item</u>	<u>Pay Unit</u>
Riprap (D ₅₀ = 9 inches)	CY

5) Fence Double Gate (6' High) (Chain Link, Barbed Wire Top, Top Rail)

This unit price per linear foot (LF) item shall be measured for payment based on the required 30' opening as shown on the plans. The bid price shall include all of the CONTRACTOR's costs of whatsoever nature including labor, material, and any incidental work and equipment necessary to install the fence gate. The unit price shall include, but not be limited to all costs for materials, labor, and any other miscellaneous items and work shown or reasonably implied on the Drawings and in the Specifications for this work, and elsewhere in the Contract Documents.

<u>Pay Item</u>	<u>Pay Unit</u>
Fence Double Gate	LF

6) Furnish and Install 48" (ID) Reinforced Concrete Pipe (Class III)

This unit price per linear foot (LF) item shall be measured for payment along the horizontal plane from beginning station to ending station for each portion of the pipeline as installed. Pipeline length shall be measured on a continuing line through all manholes.

The work includes but is not limited to locating and protection of the existing above and belowground utilities in and along the pipe length; furnishing, transporting, and installing all pipe and materials; caps, and spacers; adjusting location of existing utilities; excavation including exploratory excavation, trench support, dewatering, constructing the specific bedding, backfill including imported backfill if needed, compaction, groundwater barriers; and other miscellaneous items as required to construct the pipeline; trench support; disposal of excess excavated material and damaged materials; pressure testing the newly installed pipelines; and all other appurtenant work, materials and equipment required to construct a complete operable pipeline in accordance with the Drawings and Specifications.

LF pricing will be paid for up to 110% of pipe length as shown on the drawings. Additional pipe will be negotiated as necessary.

<u>Pay Item</u>	<u>Pay Unit</u>
Furnish and Install 48" RCP	LF

7) Furnish and Install 54" OD HDPE Pipe

This unit price per linear foot (LF) item shall be measured for payment along the horizontal plane from beginning station to ending station for each portion of the pipeline as installed. Pipeline length shall be measured on a continuing line through all manholes.

The work includes but is not limited to locating and protection of the existing above and belowground utilities in and along the pipe length; furnishing, transporting, and installing all pipe and materials; caps, and spacers; adjusting location of existing utilities; excavation including exploratory excavation, trench support, dewatering, constructing the specific bedding, backfill including imported backfill if needed, compaction, groundwater barriers; and other miscellaneous items as required to construct the pipeline; trench support; disposal of excess excavated material and damaged materials; pressure testing the newly installed pipelines; and all other appurtenant work, materials and equipment required to construct a complete operable pipeline in accordance with the Drawings and Specifications.

LF pricing will be paid for up to 110% of pipe length as shown on the drawings. Additional pipe will be negotiated as necessary.

<u>Pay Item</u>	<u>Pay Unit</u>
Furnish and Install 54" OD HDPE	LF

8) Furnish and Install 60" ID Steel Pipe Casing (Trenchless)

This unit price per linear foot (LF) item shall be measured for payment along the horizontal plane from beginning station to ending station of the casing as installed. Casing length shall be measured on a continuing line from end to end.

The work includes but is not limited to locating and protection of the existing above and belowground utilities in and along the pipe length; furnishing, transporting, and installing all pipe and materials through trenchless techniques; casing spacers; excavation including receiving pits, exploratory excavation, trench support, dewatering, backfill including imported backfill if needed, compaction, groundwater barriers; and other miscellaneous items as required to construct the pipeline; trench support; disposal of excess excavated material and damaged materials; and all other appurtenant work, materials and equipment required to construct a complete operable casing in accordance with the Drawings, Specifications, and CDOT requirements.

LF pricing will be paid for up to 110% of pipe length as shown on the drawings. Additional pipe will be negotiated as necessary.

<u>Pay Item</u>	<u>Pay Unit</u>
Furnish and Install 60" Steel ID Pipe Casing	LF

9) Furnish and Install Manhole

This unit price item shall be paid per each (EA - Depth) fitting furnished and installed as listed below. The unit price shall include, but not be limited to all costs for materials, excavation, bedding, backfill and compaction, protective wraps, and any other miscellaneous items and work shown or reasonably implied on the Drawings and in the Specifications for this work, and elsewhere in the Contract Documents.

<u>Pay Item</u>	<u>Pay Unit</u>
A. Manhole Slab Base (10 Foot)	EA
B. Manhole Slab Base (15 Foot)	EA
C. Manhole Slab Base (20 Foot)	EA

10) Effluent Box

The lump sum (LS) bid price shall include all of the CONTRACTOR's costs of whatsoever nature including labor, material, and any incidental work and equipment necessary to construct the new effluent box adjacent to the existing effluent box. The unit price shall include, but not be limited to all costs for materials, excavation, bedding, backfill and compaction, grating, reinforcement, protective wraps, connection to the existing effluent box, and any other miscellaneous items and work shown or reasonably implied on the Drawings and in the Specifications for this work, and elsewhere in the Contract Documents.

<u>Pay Item</u>	<u>Pay Unit</u>
A. Effluent Box	LS

11) Diffuser Structure

The lump sum (LS) bid price shall include all of the CONTRACTOR's costs of whatsoever nature including labor, material, and any incidental work and equipment necessary to construct the new diffuser outfall. The unit price shall include, but not be limited to all costs for materials, excavation, bedding, backfill and compaction, header piping, flanges, ports, diffuser nozzles, concrete anchors, connections, reinforcement, protective wraps, de-watering, and any other miscellaneous items and work shown or reasonably implied on the Drawings and in the Specifications for this work, and elsewhere in the Contract Documents.

<u>Pay Item</u>	<u>Pay Unit</u>
A. Diffuser Structure	LS

12) Remove Existing Effluent Pipe and Headwall

The lump sum (LS) bid price shall include all of the CONTRACTOR's costs of whatsoever nature including labor, material, and any incidental work and equipment necessary to remove 24 LF of existing effluent pipe and headwall in Persigo Wash. The unit price shall include, but not be limited to all costs for materials, demolition, labor, disposal, restoration of the Persigo Channel and ground surface, removal of concrete headwall, and any other miscellaneous items and work shown or reasonably implied on the Drawings and in the Specifications for this work, and elsewhere in the Contract Documents.

<u>Pay Item</u>	<u>Pay Unit</u>
A. Remove 24 LF Existing Effluent Pipe and Headwall	LS

13) Abandon Effluent Pipe

The lump sum (LS) bid price shall include all of the CONTRACTOR's costs of whatsoever nature including labor, material, and any incidental work and equipment necessary to abandon in place the existing effluent pipe using flow fill between the existing Effluent Box and the removal noted in Item 12. It is estimated that 75 CY of flow fill will be required to fill the remaining 48" RCP and manhole structure. The unit price shall include, but not be limited to all costs for materials, demolition, labor, restoration of the surface, and any other miscellaneous items and work shown or reasonably implied on the Drawings and in the Specifications for this work, and elsewhere in the Contract Documents.

<u>Pay Item</u>	<u>Pay Unit</u>
A. Abandon Effluent Pipe	LS

14) Cleanup and Restoration

This lump sum (LS) price shall include all costs to perform all work necessary to remove, restore, install and replace all above grade improvements including but not limited to curb, gutter, sidewalk, pavement, gravel areas, signs, fences, gates, seeding, bank restoration, and all other items not covered elsewhere in the bid form and any other miscellaneous items and work shown or reasonably implied on the Drawings and in the Specifications for this work, and elsewhere in the Contract Documents.

<u>Pay Item</u>	<u>Pay Unit</u>
Cleanup and Restoration	LS

15) Rock Excavation (Potential Quantity)

The measurement for payment of this item will be the total number of cubic yards (CY) of bedrock required to be removed for construction of the proposed pipeline and/or appurtenances; however, no measurement for payment will be made for rock excavation beyond the maximum prescribed trench width or for depths exceeding 12 inches below the pipe; nor for excavation due to negligence or unauthorized operations by the CONTRACTOR. The unit price bid per cubic yard of rock excavation shall include all of the CONTRACTOR's costs of whatsoever nature required to perform the excavation and to replace the void area with granular bedding and/or any other material specifically approved by the ENGINEER. The price bid shall include: excavation, blasting, removal and disposal of rock unsuitable material; furnishing, placing and compacting the approved backfill material required to fill the void area; and all other related and necessary materials, work, and equipment required to excavate the rock in accordance with the Contract Documents. Large cobbles will not be classified as rock excavation. While it is not anticipated that rock will be encountered a unit cost will be required.

<u>Pay Item</u>	<u>Pay Unit</u>
Rock Excavation	CY

16) Bypass Pumping

The lump sum (LS) bid price shall include all of the CONTRACTOR's costs of whatsoever nature including labor, material, and any incidental work and equipment necessary to complete a temporary bypass of effluent flows from the Persigo Wastewater Treatment Plant during connection of the new effluent structure. A bypass plan shall be submitted for review and approval 48 hrs prior to bypass pumping. The unit price shall include, but not be limited to all costs for materials including primary and backup pumps and hoses, 24 hour monitoring while the system is pumping, and any other miscellaneous items and work shown or reasonably implied on the Drawings and in the Specifications for this work, and elsewhere in the Contract Documents. See appendix for Bypass Flow requirements.

<u>Pay Item</u>	<u>Pay Unit</u>
Bypass Pumping	LS

17) Mobilization and Demobilization

No measurement for payment shall be made for any of the work, materials, and equipment required for mobilization and demobilization. The lump sum (LS) bid price shall include all of the CONTRACTOR's costs of whatsoever nature including labor, material, and any incidental work and

equipment necessary for mobilization and demobilization of personnel, equipment and supplies at the project site. This item includes installation of temporary fencing around project work areas, construction and maintenance of all access roads, and any other fencing/security items as deemed necessary by the CONTRACTOR. This item shall also include the establishment of the CONTRACTOR's field offices, buildings and other necessary facilities not specifically defined as a separate pay item, and all other costs incurred of labor and operations which must be performed prior to beginning the other items under this Contract. This item also includes obtaining permits and CONTRACTOR testing. This item may also include provision of required bonds, insurance and preparation of the project schedule. The removal of the CONTRACTOR's equipment, supplies, excess materials, and cleanup of the site are also included in this item. This item is limited to 5% of the total contract amount.

<u>Pay Item</u>	<u>Pay Unit</u>
Mobilization / Demobilization	LS

18) Minor Contract Revisions

No measurement for payment shall be made for this item. It is intended that this bid item be used as a force account for any work deemed by the OWNER to be outside of the original scope. It is not intended to cover any miscellaneous items and work shown or reasonably implied on the Drawings and in the Specifications for this work, and elsewhere in the Contract Documents. Payment must be justified by CONTRACTOR's work logs and agreed upon with the OWNER before work commences.

<u>Pay Item</u>	<u>Pay Unit</u>
Minor Contract Revisions	LS

1.4 MEASUREMENT

No quantity measurement will be made for any of the lump sum (LS) bid items. The lump sum quantity for each bid item shall include all of the Work required to be performed by the CONTRACTOR for that individual item in the schedule as described above.

1.5 PAYMENT

Each lump sum bid shall include the cost of labor, materials, equipment, transportation, incidentals, and services, properly completed in place and meeting all other requirements of the Contract Documents.

Each unit cost bid shall include the cost of labor, materials, equipment, transportation, incidentals, and services, properly completed in place and meeting all other requirements of the Contract Documents.

Payment of the bid price shall be full compensation to the CONTRACTOR for furnishing all labor, materials, equipment (except as specifically noted for work by others) and incidentals and performing all work as required and defined under these Contract Documents to complete in full the Work described and shown by the Contract Documents.

Payment shall be requested according to the procedures established by the General Conditions.

OWNER will make payment according to the procedures established by the General Conditions.

1.6 PRODUCTS (NOT USED)

1.7 EXECUTION (NOT USED)

END OF SECTION

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Coordinate operations under the contract in a manner which will facilitate progress of the Work.
- B. Conform to the requirements of public utilities and concerned public agencies in respect to the timing and manner of performance of operations which affect the service of such utilities, agencies, or public safety.
- C. CONTRACTOR is solely responsible for removal or relocation of items which may affect Work.
- D. If tight conditions develop, or if conditions differ materially from those shown on the Drawings, coordinate with the ENGINEER to develop appropriate solutions.
- E. Coordinate activities with OWNER.

1.2 CONFERENCES

- A. Hold conferences for coordination of the Work when necessary.
- B. OWNER may hold coordination conferences to be attended by all involved when CONTRACTOR's operations affects, or is affected by, the Work of others.
 - 1. CONTRACTOR shall participate in such conferences accompanied by Subcontractors as required by OWNER

1.3 PROGRESS MEETINGS

- A. CONTRACTOR shall schedule and hold regular bi-weekly (once every two weeks) progress meetings and at other times as requested by the OWNER or as required by the progress of the Work.
- B. Attendance shall include:
 - 1. CONTRACTOR and Superintendent.
 - 2. OWNER's Representative.
 - 3. ENGINEER
 - 4. Others as may be requested by CONTRACTOR or OWNER.
- C. Minimum agenda shall include:

1. Review of Work progress since last meeting.
2. Identification and discussion of items which may affect Work.
3. Review of any pending change orders.
4. Revision of Construction Schedule as appropriate.

D. CONTRACTOR, unless notified, shall preside at meetings and record minutes. Within three (3) of meeting, CONTRACTOR shall distribute minutes to participants and others as required by the OWNER and ENGINEER.

Minutes shall include:

1. 3 Week Look-Ahead Schedule
2. List of Assignments, Person Responsible, and Due Date
3. Decision Log
4. Submittal Log
5. List of RFI's and their status

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

AA	Aluminum Association
AABC	Associated Air Balance Council
AAMA	Architectural Aluminum Manufacturers Association
AC	Alternating Current
ACI	American Concrete Standards
ACGIH	American Conference of Governmental Industrial Hygienists
ADA	Americans with Disabilities Act
AFBMA	Antifriction Bearing Manufacturers Association
AGA	American Gas Association
AGMA	American Gear Manufacturers Association
AHDGA	American Hot Dip Galvanizers Association
AHJ	Authority Having Jurisdiction
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
ISI	American Iron and Steel Institute
ANSI	American National Standards Institute
APA	American Plywood Association
ASME	American Society of Mechanical Engineers
ASTM	American Society of Testing Materials
AWG	American Wire Gauge
AWS	American Welding Society
AWWA	American Water Works Association
BICSI	Building Industry Consulting International Network
CDOT	Colorado Department of Transportation

CDPHE	Colorado Department of Public Health and Environment
CDPS	Colorado Department of Public Safety
CFM	Cubic feet per minute
CRSI	Concrete Reinforcing Steel Institute
CSA	CSA Group
DHI	Door Hardware Institute
DIP	Ductile Iron Pipe
DIPRA	Ductile Iron Pipe Research Association
DWG	Drawing
EFF	Effluent Pipe
EOLL	End of Lamp Life
EMT	Electrical Metallic Tubing
EPA	Environmental Protection Agency
FRP	Fiberglass Reinforced Plastic
FSC	Forest Stewardship Council
GALV.	Galvanized
GND	Ground
GPD	Gallons Per Day
GPH	Gallons Per Hour
GPM	Gallons Per Minute
HDPE	High Density Polyethylene
HGL	Hydraulic Grade Line
HI	Hydraulic Institute Standards
HVAC	Heating, Ventilating, and Air Conditioning

HP	Horsepower
IBC	International Building Code
ICC	International Code Council
IEC	International Electro-technical Commission
IEEE	Institute of Electrical and Electronics Engineers
ISA	International Society of Automation
IMC	International Mechanical Code – or – Intermediate Metal Conduit
INV	Invert
LCP	Local Control Panel
LEED	Leadership in Energy and Environmental Design
LF	Linear Feet
MAX.	Maximum
MCC	Motor Control Center
MCIP	Motor Control Instrument Panel
MH	Manhole
MIN.	Minimum
MSL	Mean Sea Level
MSS	Manufacturers Standardization Society of the Valves and Fittings Industry
NAAMM	National Association of Architectural Metal Manufacturers
NBFU	National Board of Fire Underwriters
NBS	National Bureau of Standards
NEBB	National Environmental Balancing Bureau
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NESC	National Electrical Safety Code

NETA	National Electric Testing Association
NFPA	National Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health
NPDES	National Pollutant Discharge Elimination Systems
NPSH	Net Positive Suction Head
NPT	National Pipe Thread
NRTL	Nationally Recognized Testing Laboratory
NTU	Nephelometric Turbidity Units
NWRI	National Water Research Institute
O.C.	On Center
OSHA	Occupational Safety and Health Administration
PEFC	Program for the Endorsement of Forest Certification
P&ID	Piping and Instrumentation Diagram
PLC	Programmable Logic Controller
PVC	Polyvinyl Chloride
PSI(G)	Pounds per Square Inch (Gauge)
RCP	Reinforced Concrete Pipe
RIS	Redwood Inspection Services
RMC	Rigid Metal Conduit
ROW	Right of way
RPM	Revolutions per minute
SAE	Society of Automotive Engineers
SDI	Steel Door Institute and Steel Deck Institute
SMACNA	Sheet Metal and Air Conditioning Contractors National Association

SPIB	Southern Pipe Inspection Bureau
SS	Sanitary Sewer
SSPC	Steel Structures Painting Council
STL	Steel
TABB	Testing, Adjusting, and Balancing Bureau
TEFC	Totally Enclosed Fan Cooled
T-STAT	Thermostat
UL	Underwriters Laboratories
UV	Ultraviolet
VAC	Voltage Alternating Current
VDC	Volts Direct Current
VFD	Variable Frequency Drive
W/	With
WCLIB	West Coast Lumber Inspection Bureau
WOG	Water Oil Gas
WSP	Working Steam Pressure
WWPA	Western Wood Products Association

END OF SECTION

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Prepare and submit to OWNER for review, estimated construction progress schedule.
 - 1. Construction progress schedule shall be submitted to OWNER 10 days after Notice to Proceed is given.
 - 2. OWNER will review schedules for requirements related to other Work and usage of site.
- B. Night work may be established by CONTRACTOR as regular procedure with written permission of OWNER. Such permission, however, may be revoked at any time by OWNER if CONTRACTOR fails to maintain adequate equipment and supervision for proper prosecution and control of Work at night.
- C. For special restrictions on float and time extensions reference is made to the Agreement.

1.2 CONSTRUCTION PROGRESS SCHEDULE

- A. Form
 - 1. Prepare schedule in form of horizontal bar chart.
 - a. Provide separate horizontal bar for each trade, activity or operation.
 - b. Horizontal Time Scale: Identify first work day of each week.
 - c. Scale and spacing to allow space for notations and future revisions.
 - 2. Format of Listings: Chronological order of start of each item of Work.
 - 3. Identification of Listings: By major Specification section numbers.
- B. Content of Schedule
 - 1. Show complete sequence of construction by activity.
 - 2. Show dates for beginning and completion of each major element of construction and installation dates for major items of equipment. Elements shall include, but not be limited to:
 - a. Shop Drawing receipt from supplier/manufacturer submitted to ENGINEER, review, and return to supplier/ manufacturer.
 - b. Material and equipment order, manufacturer, delivery, installation, and checkout, including allowance items.
 - c. Performance tests and supervisory services activity.
 - d. Erosion Control Installation including Temporary Diversion (Coffer Dam)

- e. Effluent Pipe installation.
 - f. Backfilling, grading, seeding, sodding, landscaping, fence construction, and paving.
 - g. Connection to existing structure.
 - h. Trenchless Boring Schedule
 - i. Subcontractor's items of Work.
 - j. Final cleanup.
 - k. Allowance for inclement weather.
 - l. Miscellaneous concrete placement.
 - m. Demolition and removal.
 - n. Temporary treatment.
3. Show projected percentage of completion for each item as of first day of each month.

C. Schedule Revisions

- 1. Every 30 days revise construction progress schedule to reflect changes in progress of Work.
- 2. Indicate progress of each activity at date of schedule revision.
- 3. Show changes occurring since previous revised submittal.
 - a. Major changes in scope.
 - b. Activities modified since previous submittal.
 - c. Revised projections of progress and completion.
 - d. Other identifiable changes.
- 4. Every 14 days, provide narrative report defining:
 - a. Problem areas, anticipated delays, and impact on schedule.
 - b. Corrective action recommended and its effect.
- 5. Submit to OWNER after any revision.

1.3 DELAYS AND RECOVERY

- A. If, at any time during Project, CONTRACTOR fails to complete an activity by its latest scheduled completion date, CONTRACTOR shall, within 3 working days, submit to OWNER written statement as to how and when CONTRACTOR will reorganize work force to return to current construction progress schedule.
- B. Whenever it becomes apparent from progress evaluation and updated schedule data that milestone completion dates and/or contract completion dates will not be met, CONTRACTOR shall take some or all of following actions:
 - 1. Increase construction staffing in such quantities and crafts as shall substantially eliminate backlog of work.
 - 2. Increase number of working hours per shift, shifts per work day, work days per week, or amount of construction equipment, or combination of foregoing sufficient to substantially eliminate backlog of Work.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Submit Shop Drawings, Samples, Operation and Maintenance Manuals and other submittals as required by individual specification sections.
1. ENGINEER will not accept Shop Drawings or other submittals from anyone but CONTRACTOR or as directed by the CONTRACTOR.
 2. In relation to the requirements of the General Conditions on the CONTRACTOR's review, the CONTRACTOR assumes full responsibility and risk for misfits due to errors in CONTRACTOR's submittals. CONTRACTOR is responsible for the dimensions and the design of adequate connections and details.
- B. Resubmit to review a correct submittal if errors are discovered during manufacture or fabrication.
- C. Do not use materials or equipment for which Shop Drawings or samples are required until such submittals, stamped by CONTRACTOR and properly marked by ENGINEER, are at the site and available to workmen.
- D. Do not use Shop Drawings which do not bear ENGINEER's mark "REVIEWED" in the performance of the Work. Review status designations listed on ENGINEER's submittal review stamp are defined as follows:
1. REVIEWED
 - a. Signifies material or equipment represented by the submittal conforms to the design concept, complies with the information given in the Contract Documents and is acceptable for incorporation in the Work. CONTRACTOR is to proceed with fabrication or procurement of the items and with related work. Copies of the submittal are to be transmitted for final distribution.
 2. REVIEWED AS NOTED
 - a. Signifies material or equipment represented by the submittal conforms to the design concept, complies with the information given in the Contract Documents and is acceptable for incorporation in the Work in accordance with ENGINEER's notations. CONTRACTOR is to proceed with the Work in accordance with ENGINEER's notations and is to submit a revised submittal responsive to notations marked on

- the returned submittal or written in the letter of transmittal.
3. REVISE AND RESUBMIT
 - a. Signifies material or equipment represented by the submittal does not conform to the design concept or comply with the information given in the Contract Documents and is not acceptable for use in the Work. CONTRACTOR is to submit submittals responsive to the Contract Documents.
 4. INFORMATIONAL SUBMITTAL/NOT SUBJECT TO REVIEW
 - a. Signifies submittals which are for supplementary information only; pamphlets, general information sheets; catalog cuts, standard sheets, bulletins and similar data, all of which are useful to ENGINEER or OWNER in design, operation, or maintenance, but which by their nature do not constitute a basis for determining that items represented thereby conform with the design concept or comply with the information given in the Contract Documents. ENGINEER reviews such submittals for general information but not for substance.

1.2 SHOP DRAWINGS

- A. Include the following information as required to define each item proposed to be furnished.
 1. Fabrication and erection drawings.
 2. General outline drawings of items showing overall dimensions, location of major components, and weights.
 3. Detailed equipment installation drawings showing foundation and mounting details, and clearances required for erection, operation and disassembly for maintenance.
 4. Relation to adjacent or critical features of the Work or materials.
 5. Field dimensions, clearly identified as such.
 6. Applicable standards, such as ASTM or Federal Specification numbers.
 7. Type and model number of equipment.
 8. Drawings, catalogs or parts thereof, manufacturer's specifications and data, instructions, performance characteristics and capacities, and other information specified or necessary:
 - a. For ENGINEER to determine that the materials and equipment conform to the design concept and comply with the intent of the Contract Documents.
 - b. For the proper erection, installation, and maintenance of the materials and equipment which ENGINEER will review for general information but not for substance.
 - c. For ENGINEER to determine what supports, anchorages, structural details, connections and services are required for materials and equipment, and the effect on contiguous or related structures, materials and equipment.

9. Parts, devices, controls and accessories forming a part of equipment.
 10. Complete dimensions, clearances required, design criteria, materials of construction and the like to enable ENGINEER to review the information effectively.
 11. Motors: include name of manufacturer, type and model, operating speed, horsepower, voltage, temperature rating, service factor, full load current, power factor at full load, efficiency at full load, code letter, and design letter, service altitude, and other information as required by Section 01605.
 12. Product data for electrical and control panel components including starters, switches, relays, lights, etc.
 13. Schematic diagrams for electrical items and control panels showing external connections, terminal block numbers, internal wiring diagrams and one-line diagrams. A manufacturer's standard connection diagram or schematic showing more than one scheme of connection will not be accepted unless it is clearly marked to show the intended connections.
 14. Bills of materials and lists of spare parts being provided.
 15. Color cards and similar items.
 16. Descriptive literature for paint and coating systems.
 17. Net weight of completed equipment assemblies.
 18. Manufacturer's name, model number, and descriptive literature for all component parts described by a Specification Section.
- B. Manufacturer's standard drawings, schematics and diagrams:
1. Delete information not applicable to the Work.
 2. Supplement standard information to provide information specifically applicable to the Work.
- C. Manufacturer's warranties: reference Section 01740 - Warranties.
- D. Format.
1. Present in a clear and thorough manner.
 2. Minimum sheet size: 8 1/2"x11".
 3. Clearly mark each copy to identify pertinent products and models.
 4. Individually annotate standard drawings which are furnished, cross out items that do not apply, describe exactly which parts of the drawing apply to the equipment being furnished.
 5. Individually annotate catalog sheets to identify applicable items.
 6. Provide a separate transmittal form for each specific item or class of material or equipment for which a submittal is required. Transmittal of a submittal of various items using a single transmittal form will be permitted only when the items taken together constitute a manufacturer's "package" or are so functionally related that expediency indicates review of the group or package as a whole.

7. Reproduction or copies of portions of Contract Documents:
 - a. Not acceptable as complete fabrication or erection drawings.
 - b. Acceptable when used as a drawing upon which to indicate information on erection or to identify detail drawings.
8. Clearly identify the following:
 - a. Date of submission.
 - b. Project title and number.
 - c. Names of CONTRACTOR, Supplier and Manufacturer.
 - d. Specification section number, specification article number for which items apply, intended use of item in the work, and equipment designation.
 - e. Identify details by reference to sheet, detail, schedule or room numbers shown in the Contract Documents.
 - f. Deviations from Contract Documents. Revisions on resubmittals.
 - g. CONTRACTOR's stamp, initialed or signed, certifying to review of submittal, verification of products, field measurements and field construction criteria, and coordination of the information within the submittal with requirements of the Work and the Contract Documents.

1.3 SAMPLES

- A. Submit three (3) sets of samples in an orderly sequence so that interdependent materials or equipment can be assembled and reviewed together.
- B. Individually and indelibly label or tag samples indicating specified physical characteristics, manufacturer's name, color, texture, and other items that are needed for ordering and identification purposes.
- C. Unless otherwise indicated in the Contract Documents, colors and textures of specified items shall be from the manufacturer's standard colors and standard materials, products, or equipment lines as long as they meet the requirements of the Contract Documents.
- D. Upon receiving acceptance from the ENGINEER, one set will be retained by the ENGINEER, two sets of samples will be stamped and dated by the ENGINEER and returned to the CONTRACTOR who shall retain one set and transmit one set to the job site.

1.4 OPERATION AND MAINTENANCE MANUALS

- A. Submittal Requirements:
 1. Submit when work is 80% complete for all Shop Drawings for

equipment having been reviewed by ENGINEER and marked "NO EXCEPTION TAKEN".

2. Submit all other data by the time Work is 90% complete.
3. Do not start or operate equipment until respective operation and maintenance data has been reviewed, accepted and copies made available at the site.
4. The operation and maintenance manuals shall be in addition to instructions or parts lists packed with or attached to equipment when delivered.

B. Include as a minimum the following information:

1. Equipment function, normal operating characteristics, and limiting conditions. Include complete test data where applicable. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
2. Operating instructions for startup, calibration, load change requirements, routine and normal operations, adjustments, regulation and control, shutdown, disassembly, reassembly, realignment, balancing, checking, testing procedures to determine performance efficiency, tabulation of proper settings for pressure controls and valves, and emergency conditions. Include location of controls, special tools or equipment required or related instrumentation needed for operation.
3. Lubrication and routine maintenance instructions, including summer, winter, and any special operating instructions.
4. Guide to "troubleshooting".
5. Parts lists, predicted life for parts subject to wear and recommended list of spare parts to be on hand.
6. Outline, cross section, and assembly drawings; engineering data; color coded wiring diagrams as installed.
7. Copy of accepted or as constructed Shop Drawings.
8. Addresses and telephone numbers where parts may be ordered and where service may be obtained including vendor and distributor.
9. Total weight of assembled equipment and weight of individual components.
10. Safety precautions to be taken when operating or maintaining the equipment or when working near it.
11. Diffuser information required in Section 11001

C. Manufacturer's warranties: reference Section 01740 – Warranties.

D. Format:

1. Present in a clear and thorough manner. Bind manuals for similar equipment together in three ring binders or post binders. Use minimum number of binders, maximum thickness per binder 4 inches.

2. Provide divider tabs for each Division per the specifications.
3. Order of materials shall be the same as the order of specifications in the Project Manual.
4. Minimum sheet size: 8"x11".
5. Clearly mark each copy to identify pertinent products and models.
6. Fold drawings larger than 11"x17" and insert into individual pockets bound into the manuals.
7. Enclose in clear plastic sheets pages subject to frequent usage by operators.
8. Individually annotate standard drawings which are furnished, describe exactly which parts of the drawing apply to the equipment being furnished.
9. Individually annotate catalog sheets to identify applicable items.
10. Include a Table of Contents indicating all provisions included in each manual.
11. Clearly identify the following:
 - a. Date of submission.
 - b. Project title and number.
 - c. Names of CONTRACTOR, Suppliers and Manufacturers, include telephone numbers and addresses.
 - d. Names of subcontractors with telephone numbers and addresses, contracted by CONTRACTOR for servicing and maintenance of portions of the project.
 - e. Specification section number, intended use of item in the Work, an equipment designation.
 - f. Identify details by reference to sheet, detail, schedule, or room numbers shown in the Contract Documents.

1.5 SUBMISSION REQUIREMENTS

- A. Make submittals promptly in accordance with approved schedule, and in such sequence as to cause no delay in the Work or in the work of any other CONTRACTOR.
- B. Do not submit operation and maintenance data with Shop Drawings unless so specified or required by ENGINEER to determine if equipment will comply with the Contract Documents.
- C. Minimum number required:
 1. Shop Drawings.
 - a. The number CONTRACTOR requires (a maximum of four), plus one (1) copies which will be retained by ENGINEER.
 - b. Submit three (3) additional copies for inclusion in Operation and Maintenance manuals where Operation and Maintenance manuals are called for. Where field modifications are made after acceptance, indicate "as constructed" conditions, mark copies "AS CONSTRUCTED",

- and submit prior to Substantial Completion.
2. Operation and Maintenance Manuals
 - a. Number CONTRACTOR requires, plus three (3) copies to ENGINEER, for disbursement to OWNER.

1.6 RESUBMISSION REQUIREMENTS

- A. Make corrections or changes required by ENGINEER and resubmit until accepted.
- B. In writing call ENGINEER's attention to deviations that the submittal may have from the Contract Documents.
- C. In writing call specific attention to revisions other than those called for by ENGINEER on previous submissions.
- D. Shop Drawings.
 1. Include additional drawings that may be required to show essential details of any changes proposed by CONTRACTOR along with required wiring and piping layouts.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Substantiate costs when such items as mobilization and Project Closeout expense, and Bond premium, are listed separately in the schedule of values. If mobilization is listed as an item, demobilization must be listed as an item and must be at least 50% of mobilization costs. Mobilization costs are not to exceed 4% of Bid.
- B. Overhead and profit will not be listed as separate items.
- C. All pay items will be supported with acceptable documentation when required by ENGINEER.
- D. An unbalanced schedule of values providing for overpayment of CONTRACTOR on items of Work which would be performed first will not be accepted.
- E. The schedule of values will be revised, if required, and must be acceptable to OWNER prior to processing the first progress payment.

1.2 FORM AND CONTENT

- A. The schedule of values shall separate the costs by Work activity. CONTRACTOR's standard forms and computer listings prepared in conjunction with the construction schedule will be acceptable.
- B. Separate the Work activities identified as a part of the Construction Schedule into the individual cost categories.
 - 1. Identify the dollar amount of each activity allocated to applicable cost categories.
 - 2. Schedule of values may be more definitive than the construction schedule.
- C. Coordinate schedule of values with the construction schedule specified in Section 01310 – Construction Schedule.

1.3 SUBMITTAL

- A. Submit three (3) copies of the schedule of values for acceptance with Construction Progress Schedule.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

PART 1 – GENERAL

1.1 SUBSTANTIAL COMPLETION

- A. Reference the General Conditions.
- B. All work except the following must be complete for Substantial Completion:
 - 1. Seeding.
 - 2. Final cleanup.
 - 3. Extended Manufacturer's Field Services.

1.2 FINAL INSPECTION AND ACCEPTANCE

- A. Reference the General Conditions.
- B. All Work except the following must be complete for Final Acceptance.
 - 1. Not applicable.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Execute cleanup, during progress of the Work, and at completion of the Work.
- B. Adequate cleanup will be a condition for recommendation of progress payments.
- C. Store volatile wastes in covered containers and dispose offsite.
- D. Provide on-site covered containers for the collection of waste materials, debris and rubbish.
- E. Neatly store construction materials, such as concrete forms, when not in use.
- F. Broom pavements.

1.2 DISPOSAL

- A. Wastes shall not be buried or burned on the site or disposed of into storm drains, sanitary sewers, streams, or waterways.
- B. Remove waste materials, clearing materials, demolition materials, unsuitable excavated materials, debris, and rubbish from the site at least weekly and dispose of at disposal areas furnished by CONTRACTOR away from the site.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

PART 1 – GENERAL

1.1 DESCRIPTION

- A. This section describes the disposition of warranties submitted on the project.
- B. It is explicitly understood that nothing in any warrantee shall relieve the CONTRACTOR from rights and privileges of the OWNER as set forth in these Contract Documents in relation to products and services as intended or described in these Contract Documents.
- C. It is explicitly understood that all manufacturer's warranties are an attempt to limit their liability under law. As a condition of all warranties submitted by the manufacturer or others on this project it is understood that the requirements of this section supersede all warranties submitted. The ENGINEER will not review warranties as to substance of manufacturer's trying to limit their liability. All such attempts to limit liability that is in violation of these Contract Documents is void and without legal effect.
- D. The submittal of warranties on this project shall not in any way relieve CONTRACTOR of their responsibilities for CONTRACTOR's General Warranty and Guarantee and Correction Period as defined in the General Conditions and related requirements contained in these Contract Documents.

1.2 SUBMITTAL OF WARRANTIES NOT CALLED FOR IN THE CONTRACT DOCUMENTS.

- A. If the time period of the warrantee falls within the correction period specified for the project the warrantee shall be without effect on the project. CONTRACTOR may use said warrantee for their own use if CONTRACTOR elects. The ENGINEER will not review said warranties if submitted.
- B. If CONTRACTOR submits warranties and the time period of the warrantee exceeds the correction period specified for the project these warranties shall be accepted.

1.3 SUBMITTAL OF WARRANTIES CALLED FOR IN THE CONTRACT DOCUMENTS.

- A. Warranties called for in the Contract Documents shall be accepted as follows:
 - 1. ENGINEER will review the warrantee only to verify that the warrantee defines the requirements called for in the Contract

- Documents.
2. During the Correction Period of the project the warrantee shall be for the use of the CONTRACTOR as it relates to CONTRACTOR's responsibilities under the correction period.
 3. After the expiration of the correction period the rights under the warrantee shall pass to the OWNER for OWNER's use of their facilities.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Maintain at the site one record copy of:
 - 1. Documents and samples called for in General Conditions 6.19.
 - 2. Field Test Records.
 - 3. Certificates of compliance.
 - 4. Payments.

1.2 MAINTENANCE OF DOCUMENTS AND SAMPLES

- A. Store documents in CONTRACTOR's field office apart from documents used for construction.
 - 1. Provide files and racks for storage of documents.
 - 2. Provide storage space for samples.
- B. File documents and samples in accordance with the Specification's section numbers.
- C. Maintain documents and samples in a clean, dry, legible condition and in good order.

1.3 RECORDING

- A. Label each document "PROJECT RECORD" in neat large printed letters.
- B. Record information concurrently with construction progress.
 - 1. Do not cover Work until required information is recorded.
- C. Marking of Project Records.
 - 1. Legible and with a dark pen or pencil.
 - 2. Ink shall not be water based or subject to easy smearing.
- D. Mark Drawings to record actual construction.
 - 1. Field dimensions, elevations, and details.
 - 2. Changes made by a Modification.
 - 3. Details not on original Drawings.
 - 4. Horizontal and vertical locations of underground utilities and appurtenances, referenced to a minimum of two permanent surface improvements.
 - 5. Depths of various elements of foundation in relation to project datum.
 - 6. Location of internal utilities and appurtenances concealed in the

construction, referenced to visible and accessible features of the structure.

1.4 SUBMISSION

- A. Accompany submittal with transmittal letter in duplicate containing:
1. Date.
 2. Project title and number.
 3. CONTRACTOR's name, address, and telephone number.
 4. Index containing title and number of each Record Document.
 5. Signature of CONTRACTOR or his authorized representative.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

DIVISION 2
SITWORK

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Reference the General Conditions.
- B. Reference the Erosion Control Notes included in the Drawings.
- C. Removal of paving, curbs, gutters, and walks.
- D. Clear site of plant life, grass, and designated trees.
- E. Removal of unwanted structures.
- F. Removal of designated pipes.
- G. Topsoil excavation.

1.2 REGULATORY REQUIREMENTS

- A. Conform to City, County, State, and Federal regulations for disposal of debris.
- B. Coordinate clearing Work with the OWNER.
- C. Conform to the USACOE 404 Permit requirements. See Erosion Control Notes on the Drawings for additional requirements as well as a copy of the permit attached to this document.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 PREPARATION

- A. OWNER is responsible for identifying trees or other existing features slated for protection. Do not remove any trees without express permission of the OWNER.
- B. Verify that existing features designated for protection are tagged by the OWNER or identified.

3.2 PROTECTION

- A. Locate, identify, and protect utilities that remain from damage.

- B. Coordinate with the OWNER.
- C. Protect trees, plant growth, and features not designated for removal.
- D. Protect bench marks, horizontal control points, survey monuments, property pins, and existing structures from damage or displacement. Any items damaged shall be re-set by a Colorado registered Land Surveyor.

3.3 CLEARING

- A. Clear areas required for access to site and execution of Work.
- B. Remove curbs, gutters, and sidewalks as required.
- C. Remove trees and shrubs indicated. Remove stumps and root system to a depth of 4 feet and horizontally 10 feet from center of stump.

3.4 REMOVAL

- A. Removal debris, rock, and extracted plant life from site.
- B. Remove unwanted materials and structures.

3.5 TOPSOIL EXCAVATION

- A. Excavate topsoil from areas to be further excavated or re-graded.
- B. Stockpile topsoil for replacement at the end of final grading.
- C. See Erosion Control notes for excavation of wetland topsoil.
- D. Remove top 12" of armoring layer (6-12" diameter cobbles) on the Colorado Riverbed and stockpile for replacement when work is completed.

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section covers the demolition, abandonment, salvage and disposal of portions of the existing piping and outlet structure as indicated on the Drawings and Specifications.

1.2 SUBMITTALS

- A. Submit shop drawings on all materials specified.

PART 2 - PRODUCTS

2.1 NON-SHRINK BACKFILL/UNSHRINKABLE BACKFILL/FLOW-FILL

- A. Mix Design

<u>Ingredients</u>	<u>lbs./CY</u>
Cement (0.45 sack)	42
Type I-II (ASTM C150)	
Water (39 gallons)	325
Coarse Aggregate (Size no. 57)	1700
Sand (ASTM C-33)	1845

- B. Air Content: 1.5%
- C. Maximum 28 day strength: 60 psi
- D. Minimum 24 hour strength: 10 psi
- E. Slump: 6 inches

PART 3 - EXECUTION

3.1 REMOVAL OF PIPING AND OUTLET STRUCTURE

- A. CONTRACTOR shall remove existing pipes and outlet structure into Persigo Wash as shown on Drawings.
- B. Remove piping as shown on the Drawings in area of construction and disposed of offsite at dumping area provided by the CONTRACTOR.
- C. Slope into Persigo Wash shall be restored to match adjacent slopes and mimic historic channel.

3.2 ABANDONMENT

- A. CONTRACTOR shall abandon in place existing buried pipe, manholes and appurtenances that are no longer required due to the new piping IF directed by the OWNER. The intent of the project is to remove the existing outfall piping.
 - 1. Fill all inlet and outlet pipes to their crown with concrete, to a minimum distance of 3 feet from the outer wall of the manhole base section.
 - 2. Repair any damage to adjacent structures, properties, and/or pavements.
 - 3. Restore vegetation.

3.3 DISPOSAL

- A. Remove demolition debris from Work site weekly.
- B. All abandoned material shall be disposed of offsite at dumping area provided by the CONTRACTOR.

3.4 REMOVAL OF PIPING

- A. CONTRACTOR shall remove existing pipes and outlet structure as shown on Drawings.
- B. Remove piping as shown on the Drawings in area of construction and disposed of offsite at dumping area provided by the CONTRACTOR.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Remove and salvage the equipment and associated appurtenances as shown on the Drawings. Equipment to be placed within the Chlorination Building directly north of the existing sampling station.

1.2 SITE CONDITIONS

- A. CONTRACTOR shall be responsible for verifying that each and every utility in the vicinity of the work to be demolished, above and below grade, has been de-activated and is safe for demolition and removal.
- B. All existing work to remain, connected and/or adjacent to the work to be removed, shall be shored, braced, covered, or otherwise protected from damage due to demolition operations or the temporary removal of portions of any structure.

1.3 DISPOSAL OF MATERIALS AND DEBRIS

- A. All demolition materials, debris, waste, or other materials shall be collected, stored, handled, managed, and disposed in accordance with currently accepted practices at an approved, licensed, or permitted facility in accordance with applicable federal, state, and local ordinances, rules, and regulations.

1.4 PERMITS

- A. CONTRACTOR shall obtain, at his expense, any and all permits required by local, state, and federal agencies. Copies of permits shall be maintained at the site and readily produced upon request.
- B. All inspections required by the permits will be required and provisions for safe access to perform inspections shall be made by the CONTRACTOR.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 TEMPORARY SUPPORT

- A. Provide and install all temporary shoring, bracing and other supports as is necessary to prevent movement, cracking, collapse, etc. of for existing work to remain. Drilled holes, inserts, embedment and other temporary attachments that will remain visible following completion of the work shall not be permitted.

3.2 CONTAINMENT AND SECURITY

- A. Construct temporary working platform(s) below and temporary containment barriers around, all demolition work prior to commencing Work.
- B. Contain all debris, dust, fumes, etc. controlling them within the immediate vicinity of removal, through-out the duration of the demolition operations. Do not allow any materials to free-fall, rotate, swing, or otherwise release uncontrollably unless adequate precautions and protections are in place.
- C. Provide and install physical barriers to prevent access to areas that may be hazardous to workers or the public.

3.3 DEMOLITION

- A. Demolition operations shall not induce excessive vibrations to remaining, adjacent or nearby structures.

3.4 DEBRIS AND WASTE REMOVAL AND DISPOSAL AND CLEANUP

- A. Remove all debris, trash and demolition-related waste from site.
- B. Dispose of waste materials in a proper manner, in conformance with local, state and federal regulations. Submit copies of all receipts, manifests and other documentation from receiving waste site(s).
- C. Clean up spillage and wind-blown debris from public and private areas.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Disposal of unsuitable or excessive excavated materials.
- B. Related sections include but are not necessarily limited to:
 - 1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the Contract.
 - 2. Division 1 - General Requirements.
 - 3. Section 02300 – Earthwork and Trenching.

1.2 MEASUREMENT AND PAYMENT

- A. No measurement or direct payment will be made for work prescribed and accepted in this Section, but shall be included in bid schedule Items 03300, 11001, 15064, or 15074 for which this work is required.

PART 2 - PRODUCTS (NOT APPLICABLE TO THIS SECTION)

PART 3 - EXECUTION

3.1 USE OF MATERIALS

- A. Use all suitable material from required excavation, or as much thereof as may be required, for backfill, embankment, or other required earthwork.

3.2 WASTE MATERIALS

- A. Waste material from required excavation which is not suitable or required for backfilling may not be disposed on-site.

3.3 PROCEDURES

- A. Use soil erosion and sediment control procedures in accordance with CDOT Specification Section 208.

PART 4 - ACCEPTANCE

- 4.1 Acceptance by OWNER will be based on Visual Inspection.

END OF SECTION

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. This section covers site grading, excavation, subgrade preparation, backfill, compaction, trenching, and finish grading for underground piping, structural fills, embankments, and appurtenances. It also includes disposition of excess materials, provision for imported materials, sheeting, shoring, pumping, and dewatering, and temporary drainage operations.
- B. Classification of Excavated Material:
 - 1. Excavated materials will not be classified. Excavation and trenching includes the removal and subsequent handling of all materials excavated or otherwise removed in performance of the Work, regardless of the type, character, composition or condition thereof.
- C. Caution in Excavation:
 - 1. The CONTRACTOR shall proceed with caution in the excavation and preparation of trench so that the exact location of underground utilities and structures, both known and unknown, may be determined. The CONTRACTOR shall be held responsible for the repair of such structures when broken or otherwise damaged because of carelessness on his/her part.

1.2 GENERAL REQUIREMENTS

- A. With reference to the terms and conditions of the construction standards for excavations set forth in the OSHA Safety and Health Regulations for Construction, Chapter XVII of Title 29, CFR, Part 1926, the CONTRACTOR shall employ a competent person and, when necessary, a registered professional engineer, to act upon all pertinent matters of the Work of this section.
- B. Excavations shall provide adequate working space and clearances for the work to be performed therein and for installation and removal of concrete forms. In no case shall excavation faces be undercut for extended footings.
- C. Subgrade surfaces shall be clean and free of loose material of any kind when concrete is placed thereon.

1.3 QUALITY ASSURANCE

- A. Soil Compaction Tests.

1. ASTM D698 or AASHTO T99 - Standard Method of Test for Moisture Density Relations of Soils Using a 5.5 lb. Rammer and a 12 inch drop.
 - a. Use method A, B, C, or D, as appropriate, based on soil condition and judgment of the testing laboratory.
 - b. Sample tests will be representative of materials to be placed.
 - c. Determine and provide maximum density curve for each type of material encountered or utilized.
 - d. Include Atterberg Limits, gradation and specific gravity.
2. ASTM D4253, D4254 - Test of Relative Density of Cohesionless Soils.
3. Test results will be basis for Field Quality Control.

1.4 SUBMITTALS

- A. Test Certificates. Submit test certificates to enable ENGINEER to determine compliance with the Specifications of each of the following materials from each proposed source or supplier:
 1. Stabilization material.
 2. Granular material.
 3. Imported materials.
- B. Provide with this certificate a density test of a typical sample.
 1. ASTM D698 or AASHTO T99.
 2. ASTM D4253, D 4254.

1.5 JOB CONDITIONS

- A. Limits of Construction.
 1. Confine operations to within the project areas.
- B. Operations.
 1. Do not use mechanical equipment in locations where its operation would cause damage to trees, culverts, or other existing property, utilities or structures above or below ground. Hand-excavate all such locations.
- C. Drainage and Groundwater.
 1. Maintain excavations and trenches free from water during construction.
 2. Remove water encountered in excavations and trenches during construction to the extent necessary to provide a firm subgrade and remove standing water.
 3. Divert surface runoff and use sumps, gravel blankets, well points, drainage line or other means necessary to accomplish the above.
 4. Maintain excavations and trenches free from water until the structure, or pipe to be installed therein is completed, to the extent that no damage from hydrostatic pressure, flotation or other cause will result.

5. A dewatering permit is required prior to discharging groundwater. See CDOT Spec Section 107.25.
 6. Control potential on-site erosion per OWNER requirements. Reference CDOT Specification Section 208 Erosion Control as well as Erosion Control Drawing Notes.
- D. Sheeting and Shoring
1. Use sheeting and shoring when banks are not cut back on a stable slope and as necessary to protect workmen, the Work and adjacent structures and facilities from caving or sliding, or as specifically required by this document.
 2. The trench shall be adequately supported and the safety of workers provided for as required by the most recent standards adopted by the O.S.H.A. Standards Board.
 3. Sheeting removal.
 - a. Do not remove prior to backfilling.
 - b. Use effective methods to protect construction, other structures, utilities and properties during sheeting removal.
 - c. Fill voids left by sheeting removal with dry sand.
- E. Sequencing.
1. Perform pipeline installation within 100 linear feet of trench excavation.
 2. Perform trench backfill within 100 linear feet of pipe installation.
 3. Perform clean-up within 400 linear feet of trench excavation.
- F. Underground obstructions.
1. Underground obstructions known to ENGINEER are shown on Drawings. However, locations shown may prove inaccurate and other obstructions not known to ENGINEER may be encountered.
 2. Notify each utility owner and request utilities be field located by surface reference at least 48 hours prior to trenching or excavation.
 3. Expose and verify size, location and elevation of underground utilities and other obstructions where conflicts might exist sufficiently in advance to permit changes in the event of conflict.
 - a. Notify OWNER in case of conflict.
 - b. In case of conflict, the proposed Work may be changed by ENGINEER.
 - c. Note all underground utilities and obstructions on Project Record Documents. Included type, size, material, location, and elevation.
 4. Maintain, protect and support by shoring, bracing or other means existing utilities and appurtenances.
 5. Take such protective measures as the utility may direct where alterations or moving of utilities is required.
 6. If CONTRACTOR elects to remove underground obstructions, replacement shall be done with new materials. Restoration shall be equal or better than the original conditions.

- G. Weather.
 - 1. Do not backfill or construct fills or embankments during freezing weather.
 - 2. Do not place backfill, fill or embankment on frozen surfaces.
 - 3. Do not place frozen materials, snow or ice in backfill, fill or embankments.
 - 4. Do not deposit, tamp, roll or otherwise mechanically compact backfill in water.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Select transportation schedule and truck routes with approval of OWNER to keep impacts on public to a minimum.
- B. Do not stockpile materials against existing structures or Work.

1.7 MAINTENANCE AND CORRECTION

- A. Scarify surface, reshape, and compact to required density completed or partially completed areas of Work disturbed by subsequent construction operations or by adverse weather.
- B. Maintain and correct backfill, fill and embankment settlement and make necessary repairs to pavement structures, seeding and sodding which may be damaged as a result of settlement for period of one (1) year after Substantial Completion and acceptance of the Work.
- C. CONTRACTOR may perform such maintenance and correction by subcontract.
- D. Submit with application for final payment a copy of any subcontract or authorization as evidence of CONTRACTOR's faithful intention to perform necessary corrections during the one (1) year correction period.

PART 2 – PRODUCTS

2.1 FILL MATERIAL

- A. Structure Backfill, Fill and Embankment. (Select Fill Material)
 - 1. Existing excavated soil, granular sand, gravel, cobble and boulder material, free from frozen material, organic material, trash, glass, broken concrete, other corrosive or deleterious material and rocks, stones, or boulders larger than 6 inches in any dimension.
 - a. Use suitable on-site excavation or stockpiled materials to the greatest extent possible.
 - b. Haul excess and unsuitable material.
 - c. Excavated bedrock shall not be used as structure backfill or

- d. trench backfill.
- d. Structure backfill material shall have a liquid limit less than 35 and a plastic index less than 6 when tested in accordance with AASHTO T-89 and T-91, respectively. Fill and embankment material need not meet liquid limit and plastic index above.
- 2. Other size restrictions are as follow:
 - a. 1-1/2 inches in any dimension for material placed within one foot of structures, pavement subgrade or finished surface in unpaved areas.
 - b. 6 inches in any dimension for the remainder of the excavation provided they are distributed in the finer material.
- B. Granular Material.
 - 1. Crushed rock or gravel meeting the requirements of ASTM C33 with 100% passing a 3/4 inch sieve and not more than 5% passing No. 4 sieve, or
 - 2. Well graded crushed, stone or gravel: ASTM C33, gradation 67.
- C. Pea Gravel
 - 1. Naturally round aggregate with 100% passing a 3/8 inch sieve and not more than 5% passing No. 4 sieve.

2.2 STABILIZATION MATERIAL

- A. Top 6 inches of pipe subgrade.
 - 1. Pit-run gravel or crusher-run rock: ASTM D448, size No. 357 (2" to No. 4).

<u>SIZE</u>	<u>PERCENT PASSING</u>
2 1/2"	100
2"	95-100
1"	35-70
1/2"	10-30
#4	0-5

- 2. Or, Granular material above.
- B. Subgrade below top 6 inches - Same as top 6 inches except that broken concrete and rock may be included in sizes which permit compaction as specified without discernible voids.
- C. Acceptable types of filter fabric and their manufacturers:
 - 1. Mirafi 140, by Celanese.
 - 2. Supac 4 1/2 NP, by Phillips.
 - 3. Typar 3471, by Dupont.
 - 4. GTF 130D, by Exxon.

2.3 BEDDING MATERIALS

A. Definition:

1. Materials placed from the subgrade to an elevation 12 inches above the top of pipe; including laterals.
2. CDOT Class 1 Material

B. Pea Gravel

1. Naturally round aggregate with 100% passing a 3/8 inch sieve and not more than 5% passing No. 4 sieve.

C. Granular material

1. Angular crushed rock, free of corrosive properties and conforming to the following gradation limits when tested by means of laboratory sieves.

<u>SIZE</u>	<u>PERCENT PASSING</u>
1"	100
3/4 Inch	90-100
3/8"	20-55
#4	0-10
#8	0-5

D. Flowable Fill - (Non-shrinkable trench backfill)

1. Non-shrinkable trench backfill shall meet the following requirements:

<u>Ingredients</u>	<u>lbs/C.Y.</u>
Cement (0.45 sacks)	42
Type of Cement, ASTM C150, I or II	
Water (39 gallons)	325
Coarse Aggregate, ASTM C33, 3/4 inch	1700
Sand, ASTM C33	<u>1845</u>
TOTAL WEIGHT PER CUBIC YARD	3912

2. Minimum Slump: 6 inches
3. Minimum 28 day strength: 40 psi
4. Maximum 28 day strength: 60 psi
5. Non-shrinkable trench backfill shall be adequately vibrated to ensure consolidation.

E. Concrete.

1. Compressive strength: 3000 psi minimum and 4000 psi maximum at 28 days minimum.
2. Meet requirements of Section 03300 Cast In Place Concrete.

F. Barrier material.

1. Soil Classification.
 - a. GC - clayey gravels, gravel-sand-clay mixtures.

- b. SC - clayey sands, sand-clay mixtures.
- c. CL - inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, clean clays.
- d. Material shall not be lumpy or hard but shall be finely divided, suitable, and free from stones.
- e. Flowable fill. Refer to Article 2.3 D., above.

2.4 TRENCH BACKFILL MATERIAL

- A. Trench backfill material for pipeline shall be either soil excavated from the trench, or imported soil. Existing excavated soil used for trench backfill, shall be free from frozen matter, stumps, roots, brush, other organic material, corrosive material, debris and other items. In addition, suitable material shall meet the following requirements:
 - 1. Upper portion of trench: Material placed within one (1) foot of pavement subgrade or finished surface in unimproved areas to a point eighteen (18) inches above the pipeline, shall be soil free from rocks greater than six (6) inches in nominal diameter.
 - 2. Other portions of trench: From a point eighteen (18) inches above the pipeline to within one (1) foot of the pavement subgrade or finished surface in unimproved areas, maximum size of any rock in the trench backfill shall be twelve (12) inches in any dimension provided these rocks are distributed in the finer material.
 - 3. If imported soil is used for trench backfill, it shall meet the AASHTO/USCS classification of the excavated material at the existing soil stratification.

PART 3 – EXECUTION

3.1 GENERAL

- A. Preparation.
 - 1. Clear and strip surface vegetation, sod and organic topsoil from subgrades for permanent construction, fills or embankments, six (6) inch minimum depth.
 - 2. Clear areas to be occupied by permanent construction or embankments.
 - a. Remove and dispose of stumps, roots over 4 inches in diameter and matted roots to the following depths:
 - 1) 18 inches below footings and parking areas
 - 2) 12 inches below walks
 - 3) 24 inches below roadways
 - b. Fill depressions with Granular Material.
- B. Stockpiling Excavated Materials.
 - 1. Pile suitable material for backfilling in an orderly manner a sufficient distance from banks of excavations and trenches to avoid

- overloading and to prevent slides or cave-ins.
 - 2. Remove and dispose of excess excavated materials not suitable or not required for backfilling.
 - 3. Do not stockpile excavated material against structures or appurtenances.
- C. Dispose all on-site excavated rock and bedrock material; excess excavated materials and material not suitable for use on the project in the designated area as shown on the drawings. If excavated materials are disposed on private property, written permission shall be obtained from the property owner and a copy given to ENGINEER.

3.2 EXCAVATION

- A. Provide adequate space and clearances for the Work and for installation and removal of concrete forms.
- B. Do not undercut excavated faces for extended footings.
- C. Granular material for footings and grade beams shall be founded on original, undisturbed soil or on structural backfill extended to the undisturbed soil. Granular material for footings and grade beams shall not be founded on existing fill at the site. If existing fill is at subgrade, excavate to original undisturbed soil and bring to proper grade with structural backfill.
- D. Fill material encountered at the site shall be removed. It may be stockpiled for reuse in backfills and embankments if it meets the requirements of the Specifications.
- E. Unauthorized Excavation.
 - 1. Except where otherwise shown, specified or authorized by ENGINEER, replace materials excavated below the bottom of concrete walls, footings slabs on grade and foundations with concrete at the same time and monolithic with the concrete above.

3.3 SUBGRADE

- A. Scarify to a depth of six (6) inches and compact.
- B. Do not work on subgrade while ground is frozen or muddy.
- C. Remove exposed cobbles, stones or boulders greater than six (6) inches in size that create an irregular surface at subgrade. Backfill resulting voids with Granular Fill compacted to specified density.
- D. Carefully compact near structures and over pipe to avoid damage.

- E. Compact and consolidate subgrades for structures or trench bottoms such that they are free from mud and sufficiently stable to remain firm, dense and intact under the feet of the workmen.
 - 1. Reinforce subgrades with Stabilization Material which are otherwise solid, but become muddy on top due to construction operations.
 - 2. Finish stabilized subgrade to elevations shown on Drawings.

- F. Stabilization:
 - 1. Wherever wet or otherwise unstable material that is incapable of supporting the pipe or structure is encountered in the bottom of the excavation or trench,
 - a. Overexcavate such material to a depth suitable for construction of a stable subgrade.
 - b. Backfill overdepth with Stabilization Material or Granular Material.
 - 2. Use filter fabric where necessary around Stabilization Material, Granular Bedding Material and on the subgrade to stabilize subgrade and prevent fines from migrating into granular materials.

- G. Level and roll subgrade so that surface materials will be compact and bond well with the first layer of the backfill, fill or embankment.

- H. Underlay slabs on grade with a minimum of twelve (12) inches of Granular Material, or greater depth if shown on Drawings, covered by 8 mil polyethylene sheeting.

- I. Place and compact fill to an elevation at least one foot above top of proposed pipe where pipe will pass through backfill or fill prior to beginning trenching.

3.4 BACKFILL, FILL, AND EMBANKMENT

- A. Import material if compaction cannot be obtained with job excavated material or if job excavated material does not meet the Specifications. Material will require careful excavation and sorting.

- B. Use of rocks or stones within the allowable size limit in the remainder of backfills, trenches, fills or embankments is subject to their not interfering with proper compaction.

- C. Place on suitably prepared subgrade.

- D. Spread and compact materials in horizontal lifts not exceeding eight (8) inches in uncompacted thickness but in thin enough layers to provide adequate compaction throughout the entire lift.
 - 1. Spread and level material deposited in piles or windrows prior to compaction.

2. Distribute material so as to preclude the formation of lenses of material differing from the surrounding materials.
- E. Fill voids caused by excavation of unsuitable material with Granular Material in areas where structures, foundations, or slabs will be constructed.
- F. Compaction Around Structures.
 1. Mechanically compact.
 - a. Use platform type tampers or similar equipment.
 - b. Rolling is permitted provided proper compaction is obtained and adequate measures are taken to prevent damage to structures.
 2. Do not backfill against new concrete walls less than 14 days after removal of forms.
 - a. Do not exceed ten (10) foot heights with backfill in less than 21 days after removal of forms.
- G. Compaction Equipment.
 1. Use equipment suited to the soil being compacted.
 2. Sheepfoot Roller: If used, provide with cleaner bars so attached as to prevent the accumulation of material between the tamper feet.
 3. Rollers: designed so that the effective weight can be increased.
- H. Rock and bedrock encountered in the excavation shall be separated from other excavated material and disposed of by CONTRACTOR.
- I. Do not compact by use of water flooding or jetting.

3.5 TRENCHING

- A. Excavate trenches by open cut methods.
 1. Provide adequate subgrade clearance for pipe bells and for compaction of bedding material under the bells and pipe.
 2. Do not allow bells or fittings to support or be in contact with the trench subgrade or walls. Provide a minimum of 3 inches bedding material beneath bells and fittings.
 3. Pipelines in fill areas: excavate trenches after fill has been placed and compacted.
- B. Do not use mechanical equipment in locations where its operation would cause damage to trees, culverts, or other property, utilities, or structures above or below ground. In all such locations, hand excavating methods shall be used.
- C. Use mechanical equipment so designed and operated that the rough trench excavation bottom elevation can be controlled with uniform trench widths and vertical sidewalls from an elevation one (1) foot above

the top of the installed pipe to the bottom of the trench, and trench alignment sufficiently accurate to permit pipe to be aligned properly with adequate clearance between the pipe and sidewalls of the trench. Do not undercut the trench sidewall to obtain clearance.

- D. Excavation in Rock.
 - 1. Over excavate a minimum of six (6) inches below the bottom of the pipe.
 - 2. Backfill with Granular Material.

- E. Preparation of Trench Bottom.
 - 1. Grade trench bottoms uniformly to provide clearance for each section of pipe.
 - 2. Remove loose materials, water and foreign objects.
 - 3. Provide firm subgrade suitable for application of the bedding material.
 - 4. Wherever unstable material is encountered in the bottom of the trench,
 - a. Over-excavate such material to a depth suitable for construction of a stable subgrade.
 - b. Backfill over-depth with Stabilization Material and compact.

- F. Limiting Trench Widths.
 - 1. Excavate trenches to a width necessary to provide 18 inch minimum working space between pipe and trench wall for proper pipe installation, jointing and bedding.

3.6 PIPE BEDDING

- A. Bedding classes. Place pipe bedding in accordance with the details shown on the Drawings. Provide higher class bedding where maximum trench width or maximum depths are exceeded or unexpected trench conditions are encountered and a higher class is required to avoid overloading the strength of pipe being placed as determined by ENGINEER. CONTRACTOR may elect to use a higher class pipe in lieu of a higher class bedding.

- B. Placement and Compaction.
 - 1. Distribute and level bedding material to provide uniform and continuous support beneath the pipe at all points between bell holes or pipe joints.
 - 2. Deposit bedding material and compact uniformly and simultaneously on each side of the pipe to prevent lateral displacement.
 - 3. Compact Granular bedding material by vibrating, slicing with a shovel or bent tee-bar.

- C. Overdepth Excavation.
 - 1. Restore overexcavated subgrades to proper elevation with Stabilization Material.
- D. Ground Water Barriers.
 - 1. To impede passage of water through bedding material, construct a ground water barrier the full trench width, four feet long, and from the bottom of all Granular Material to the top of all Granular Material.
 - 2. Locations.
 - a. Approximately 10 feet downstream from each manhole.
 - b. 20 feet outside of structures and slabs and spaced not more than 400 feet apart.
 - c. At the midpoint of piping crossing the embankments. Every 400 feet for piping paralleling the top of the embankments.
 - d. One groundwater barrier is a minimum on all piping using Granular Bedding Material.

3.7 TRENCH BACKFILL

- A. Backfill trench properly after completion of pipe bedding.
- B. Use Granular Material to top of trench for all piping beneath concrete structures and concrete slabs.
- C. Where trench for one (1) pipe passes beneath trench for another pipe, backfill and compact the lower trench to the bottom of the upper trench using Granular Bedding Material trench backfill prior to installation of the pipe in the upper trench.
- D. Deposit backfill material in uniform layers not exceeding eight (8) inches in uncompacted thickness. Increased layer thickness may be acceptable provided it is demonstrated that the specified compacted density will be obtained.
- E. Use methods and equipment appropriate for the backfill material. Do not use equipment or methods that will transmit damaging shocks to the pipe.
 - 1. Do not perform compaction by jetting or flooding.
- F. Import trench backfill material for trench backfill if compaction can not be obtained with job excavated material.

3.8 SHEETING AND SHORING

- A. If steel sheet piling is required, piling shall be driven to form a tight bulkhead. A driving head shall be used and any piling which is damaged in driving shall be pulled and replaced.

- B. If splicing is required; splicing will be limited to three (3) per pile sheet and jointed with a full penetration butt weld.
- C. Sheeting Removal.
 - 1. Do not remove sheeting prior to backfilling.
 - 2. Use effective methods to protect the construction, other structures, utilities and properties during sheeting removal.
 - 3. Fill voids left by sheeting removal with dry sand.
 - 4. Sheeting which is left in place shall be cut off at an elevation 2 feet below the finish grade of unpaved areas, or the subgrade of paved areas.
- D. Trench boxes may be used as an alternate to steel sheet shoring.
- E. If shoring is removed or trench boxes are used, provide secondary trench boxes to protect all parties entering trenches at all locations other than where shoring or primary trench boxes are located.

3.9 FINISH GRADING

- A. Grade all areas after structures, trenching, backfills, and fills have been completed to slopes, contours or elevations indicated on the Drawings. Compact with uniform levels or slopes between points where elevations are shown.
 - 1. Shape the surface of areas under slabs to line, grade and cross section, with the finish surface not more than 0.00' above or 0.10' below the required subgrade elevation, compacted as specified, and graded to prevent ponding of water.
 - 2. Shape the surface of the areas under pavement surface not more than 1/4" above or 1/2" below the required subgrade elevation. Grade to prevent ponding of water where feasible.
 - 3. Existing contours shall be mimicked to the extent possible which may result in ponded areas.
- B. Finish ditches and grading to ensure proper positive flow and drainage. Conduct final rolling operations to produce a hard, uniform and smooth cross-section. Provide effective drainage with slopes of at least one (1) percent unless otherwise indicated.

3.10 FIELD QUALITY CONTROL

- A. Field Compaction Control.
 - 1. Field tests will be conducted by OWNER to determine compliance of compaction methods with specified density in accordance with:
 - a. ASTM D2922 (AASHTO T238) - Tests for Density of Soil and Soil - Aggregate In-Place by Nuclear Methods, or
 - b. ASTM D1556 (AASHTO T191) - Tests for Density of Soil In-Place by the Sand Cone Method, or

- c. ASTM D2167 (AASHTO T205) - Tests for Density of Soil In-Place by Rubber-Balloon Method.

- B. Compaction shall be to the following minimum densities, reference ASTM D698 or AASHTO T99 unless otherwise indicated:
 - 1. Subgrade under pipe, footings, foundations, structures and slabs: 95%
 - 2. Structural backfill: 95%
 - 3. Fills and embankments.
 - a. Under slabs or pavement areas: 95%
 - b. Open areas: 90%
 - 4. Pipe bedding.
 - a. Carefully compacted select soil: 90%
 - b. Compacted Granular Material: 80% (ASTM D4253, D4254)
 - 5. Trench backfill.
 - a. Under footings, foundations, structures, pavement, slabs, and sidewalks (full depth): 95%
 - b. Upper 4 feet: 95%
 - c. Below upper 4 feet: 90%
 - 6. Granular Material: 80% (ASTM D4253, D4254)
 - 7. Seeded areas: 88% top 18 inches
 - 8. All other areas 95%
 - 9. Where granular materials are used in lieu of cohesive soils reduce the above percentages by 15% for select soils to arrive at the relative density and ASTM D4253 and D4254 shall apply.

- C. Moisture Content.
 - 1. Compact non-clay materials within 2% (+/-) of the optimum moisture content of the soil, compact clay materials at optimum moisture to 4% above optimum moisture as determined by ATSM D698.
 - 2. Water shall be added to the material, or the material shall be harrowed, disced, bladed, or otherwise worked to insure uniform moisture content, as specified.

3.11 COMPACTION TEST FAILURE

- A. If the required state of compaction is not obtained, it shall be the responsibility of the CONTRACTOR to re-compact the material to the required state of compaction. The OWNER may require that the backfill be removed and re-compacted or replaced.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Aggregate base or surfacing for roadways.
- B. Related sections include but are not limited to:
 - 1. Division 0- Bidding Requirements, Contract Forms, and Conditions of the Contract.
 - 2. Division 1- General Requirements.
 - 3. Division 2 - Site Work.

1.2 MEASUREMENT AND PAYMENT

- A. Aggregate Base Course
 - 1. No measurement or direct payment will be made for aggregate base course for roads, the cost of this work shall be included in Item 15074.

1.3 QUALITY ASSURANCE

- A. Referenced Standards
 - 1. American Association for Testing and Materials(ASTM).
 - a. C535, Standard Test Methods for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 - b. D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort.
 - c. D1557, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort.
 - d. D2922, Standard Test Methods for Density of Soil and Soil-Aggregate-In- Place By Nuclear Methods (Shallow Depth).
 - e. D3017, Standard Test Methods for Moisture Content of Soil and Soil-Aggregate-In-Place Nuclear Methods (Shallow Depth).

PART 2 - PRODUCT

2.1 MATERIALS

- A. Aggregate Surfacing
 - 1. Crushed Gravel or Crushed Rock.
 - a. Angular, hard, dense, durable particles, free from vegetable

matter, lumps or balls of clay, and other deleterious substances, crushed and graded uniformly to meet the grading requirements, by weight, as determined by laboratory sieves, shown in Table 1.

Table 1

Sieve Size	Percent by Weight Passing Sieve Size
1 1/8-inch square mesh sieve	100
No. 4-mesh sieve	38 to 65
No. 8-mesh sieve	25 to 60
No. 30 mesh sieve	10 to 40
No. 200-mesh sieve	5 to 15

- b. Material passing the No. 40-mesh sieve shall have a liquid limit of not more than 30 and a plasticity index of 4 to 9. The lower plasticity index limit may be waived if the fractured faces are 100% or more as determined in Section d. below or the minus No. 8 fraction has a dry unconfined compressive strength greater than 200 psi.
- c. Fractured Faces - Not less than 65% by weight of the particles retained on the No. 4 sieve shall have at least one manufactured face.
- d. The Los Angeles Abrasion loss shall not exceed 50% when tested in accordance to ASTM C535 at 500 revolutions.

B. Aggregate Base

1. Crushed Gravel or Crushed Rock

- a. Angular, hard, dense, durable particles, free from vegetable matter, lumps or balls of clay, and other deleterious substances, crushed and graded uniformly to meet the grading requirements, by weight, as determined by laboratory sieves, shown in Table 2.

Table 2

Sieve Size	Percent by Weight Passing Sieve Size
1 1/8-inch square mesh sieve	100
No. 4-mesh sieve	38 to 65
No. 8-mesh sieve	25 to 60
No. 30 mesh sieve	10 to 40
No. 200-mesh sieve	3 to 12

- b. Material passing the No. 40-mesh sieve shall have a liquid limit of not more than 25 and a plasticity index of not more than 6.
- c. Fractured Faces - Not less than 65 % by weight of the particles retained on the No. 4 sieve shall have at least one manufactured face.
- d. The Los Angeles Abrasion loss shall not exceed 50% when tested in accordance to ASTM C535 at 500 revolutions.

PART 3 - EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

A General

- 1. General: Prepare the surface that the aggregate course is to be placed upon according to ASTM D698 and Section 02934.

B. Mixing and Spreading.

- 1. Provide an aggregate and water mixture suitable for compaction. Spread the mixture on the prepared surface in a uniform layer. Do not place the mixture in a layer exceeding four (4) inches in compacted thickness. When more than one layer is necessary, shape and compact each layer before the succeeding layer is placed. Route hauling equipment uniformly over the full width of the surface to minimize rutting or uneven compaction. Shape the final layer to line, grade, and typical section.
- 2. Prior to spreading, uniformly mix the aggregate and bring it to within 2% of optimum moisture content.

C. Compacting.

- 1. Compact each layer full width. Roll from the sides to the center, parallel to the centerline of the road. Compact each layer of aggregate to not less than 95% of maximum density. Along curbs, headers, walls, and all places not accessible to the roller, compact the material with approved tampers or compactors.
- 2. Use ASTM D1557, Method D to determine the maximum density. Use ASTM D2922, and ASTM D3017, or other approved test procedures to determine the in-place density and moisture content.

D. Finishing

- 1. During finishing operations remove all material larger than 6 inches within the top 3 inches of the finished grades. Remove unsuitable material from the roadway finished grades and replace with suitable

material. Finish the roadway subgrade and ditches to match existing elevations.

- E. Surface Tolerance.
 - 1. Use a 10 ft straightedge to measure the final surface at designated sites. A defective area is an area with surface deviations in excess of 0.50 inch. Correct all defective areas by loosening the material, adding or removing material, reshaping, and compacting.
 - 2. Tolerances for Finished Grades:

Table 3

Staking Phase	Horizontal (ft.)	Vertical (ft.)
Typical Sections, Slope Stakes, and Slope Stake References	+/- 0.2	+/- 0.1
Roadway Subgrade Finish Stakes	+/- 0.2	+/- 0.03

- F. Maintenance.
 - 1. Maintain the aggregate course to the correct line, grade, and typical section by blading, watering, rolling or any combination thereof until placement of the next course. Should irregularities develop in any surface during or after compaction, loosen the surface and correct defects. Recompact the disturbed area.

PART 4 - ACCEPTANCE

4.1 ACCEPTANCE

- A. Untreated aggregate course gradation, construction, and other aggregate quality properties will be accepted under measured and tested conformance.
- B. The point of acceptance sampling for testing shall be from the windrow of the roadbed after processing. Gradation, liquid limit, plastic index and density tests shall be performed on each 1,000 tons placed.

END OF SECTION

PART 1 - GENERAL

1.1 WORK INCLUDED:

- A. This section covers the furnishing and installation of steel casing pipe and appurtenances.

1.2 RELATED WORK:

- A. General Conditions and Division 1 - General Requirements
- B. Section 02300 – Earthwork and Trenching

PART 2 - MATERIALS

2.1 STEEL CASING PIPE AND APPURTENANCES

A. Casing Pipe

Steel casing pipe shall have a smooth wall and shall conform to A.S.T.M. Designation A139, Grade B structural with a minimum yield strength of 36,000 psi. Casing pipe joints shall be beveled for field butt welding. Steel casing pipe minimum wall thickness of 0.75" and shall be fabricated in accordance with AWWA C-200. The outside and inside surfaces of the steel casing shall be bare, unless otherwise required by the Contract Documents. All steel casing pipe diameters on the drawings shall be "minimum finished interior diameter."

B. Joints

Pipe and fittings shall be furnished with welded joints. The joint shall be suitable for a safe working pressure equal to the class of pipe as calculated by the formula $P = 2tfs/D$, where t = steel wall thickness, D = pipe diameter, and fs = 50% of the yield strength of the steel. The joint shall operate satisfactorily with a deflection, the tangent of which is not to exceed $.75"/D$ where D is the outside diameter of the pipe in inches.

C. Accessories

1. Casing Seals

Casing seals shall be high density butyl rubber with stainless steel

strap, Model W as manufactured by Pipeline Seal and Insulator Co., or equal.

2. Casing Spacers

Casing spacers shall be 12" wide, with a two piece stainless steel shell. Runners shall be constructed of high molecular weight polymer, Model CCS as manufactured by Cascade Waterworks Manufacturing Co., or equal.

PART 3 - EXECUTION

3.1 STEEL CASING PIPE INSTALLATION

- A. The casing shall be installed by boring and jacking and shall be constructed according to the locations and grades as shown on the Contract Drawings.
- B. The casing pipe shall be installed pursuant to all requirements of the Colorado Department of Transportation. The casing pipe shall not deviate from a straight line, at any point along the alignment by more than 0.2 feet. The grade of the casing shall be maintained within 0.2 feet and the casing alignment shall be maintained within 0.5 feet.
- C. Carrier Pipe Installation
 - 1. All carrier pipe joints within casing to be restrained. Join pipe in accordance with the applicable pipe specification sections, including joint bonding if pipe line is cathodically protected.
 - 2. If carrier pipe is ductile iron, secure polyethylene wrap so casing spacers fit over the wrap. Attach casing spacers no more than two feet from each end of the casing pipe and at no greater than 10' intervals inside the casing pipe.
 - 3. Fill the annular space between the casing and the carrier pipe with clean, dry sand for the entire length of the casing.
 - 4. Seal the ends of the casing pipe with casing seals.
- D. The Contractor shall develop a geotechnical monitoring plan for use during installation of the casing pipe by boring and jacking. The geotechnical monitoring plan shall be submitted a minimum of seven (7) days prior to beginning installation of the carrier pipe under I-70. At a minimum, the geotechnical monitoring plan shall include:
 - 1. Baseline survey of roadway surface before construction begins.

- Survey shall include a minimum of 20 points per direction of I-70 (40 total points).
 - 8 points shall be along the proposed pipe centerline and 6 points shall be located 10' to the east and 10' to the west of the boring centerline.
 - Surveyor shall be certified by CDOT for access within ROW.
2. Plan for visual inspection of road surface during boring installation.
 3. Frequency of visual inspections. At a minimum, inspection shall be three times daily. (One before start of work, one midday, one at end of work).
 4. Reporting plan for visual inspections.
 5. Minimum tolerance for notification and shut down. Minimum tolerance for notification of CDOT and Engineer is 1" in any direction. Minimum tolerance for shutdown of the project is 2" in any direction.
 6. Plan of Action (POA) if settlement is detected. Development and implementation of mitigation measure shall be the responsibility of the Contractor subject to approval of the Engineer, CDOT, and City of Grand Junction. At a minimum, the POA shall include:
 - Project Contacts:
 - CDOT Joel Berschauer at (970) 683-6288.
 - CGJ Lee Cooper at (970) 256-4155.
 - Geotech Mike Berry at (970) 255-8005.
 - Engineer Colin Haggerty at (303) 704-8172.
 - Closure Plan
 - Detour Route
 - Remediation Subcontractors
 - Allowable mitigation methods - Mitigation measure include but are not limited to compaction grouting through the embankment below I-70 to raise the grade. Include details on mitigation methods including max pressures
 - Ground support methods at launch pits
 - Mitigation methods if road raises.
 7. Repair work shall occur 24 hours per day, seven (7) days per week until road is repaired to CDOT's acceptance.
 8. Proposed pavement cross section if needed
 9. All costs for the monitoring plan, traffic control, execution, and any necessary repair work shall be completed at the Contractor's expense and included in the bid price per linear foot with no costs to CDOT or the City of Grand Junction

3.2 PIPE INSTALLATION - GENERAL

A. Underground Interference

A reasonable attempt has been made to locate and identify the

underground interferences to be encountered. However, it shall be the responsibility of the CONTRACTOR to verify the locations shown on the Drawings. It shall also be the responsibility of the CONTRACTOR to locate any interference not shown on the Drawings. The CONTRACTOR shall exercise care when working in order to protect all underground interference and shall be fully responsible for any and all damage caused by his operations.

B. Pipe Alignment and Grade

In laying pipe, maximum tolerance is permitted to set line within +/-0.3 foot and grade within +/-0.1 foot.

C. Deviation from Alignment and Grade Occasioned by Other Structures

Whenever obstructions, not shown on the plans, interfere to such an extent that an alteration in the plans is required, the ENGINEER shall have the authority to determine the best method of correction. He may change the plans and order a deviation from line and grade, or he may instruct the OWNER to arrange with the CONTRACTOR to arrange with the OWNERS of the structure for its removal, relocation or reconstruction, as best fits the economic and field conditions.

D. Temporary Bulkhead

Whenever the pipe is left unattended, temporary plugs shall be installed at all openings. Temporary plugs shall be watertight and of such design as to prevent children, animals, or debris from entering the pipe. If water accumulates in the trench, the plugs shall remain in place until the trench is dry.

E. Connection of Pipelines of Dissimilar Metals

Insulated couplings or insulated flange kits shall be used when joining pipes of dissimilar metal either above or belowgrade.

END OF SECTION

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. This section covers ground preparation for all areas disturbed by construction activities.
- B. This section addresses work within the limits of disturbance as shown on the Drawings. However, if disturbance does occur outside of this designated area, this section will also pertain to those areas, which have been disturbed.
- C. See CDOT Standard Specifications 207 and 212 for additional detail.

1.2 INITIAL INSPECTION

- A. The CONTRACTOR will inspect existing site conditions and note irregularities affecting work of this section. Verify that grading operations have been satisfactorily completed and that topsoil of adequate quantity and quality has been replaced in all areas as specified. Verify that the area to be revegetated is protected from concentrated runoff and sediment from adjacent areas. Note any previous treatments to the area such as temporary seeding or mulching and discuss how these treatments will affect permanent revegetation with the ENGINEER. Report all irregularities affecting work of this section to the ENGINEER before beginning work. Beginning work of this section implies acceptance of existing conditions.

1.3 CLEANING

- A. Perform cleaning daily during installation of the work, and upon completion the work. Remove and haul from the site all excess materials, debris, and equipment. Repair damage resulting from ground preparation operations.

PART 2 – PRODUCTS

2.1 FERTILIZER

- A. Fertilizer to comply with Section 212 of 2011 Edition Standard Specifications for Road and Bridge Construction by Colorado Department of Transportation.

2.2 TOPSOIL

- A. Topsoil to comply with Section 207 of 2011 Edition Standard Specifications for Road and Bridge Construction by Colorado Department of Transportation.

PART 3 – EXECUTION

3.1 GENERAL SOIL PREPARATION

- A. Verify that the area has been prepared as per Section 02220.
- B. Till and fertilize areas to be disturbed.
 - 1. Thoroughly till the ground to a depth of 4 inches after areas have been cleared and brought to grade.
 - a. Work the soil only when moisture conditions are suitable.
 - 2. Mix fertilizer into top 2 to 3 inches of soil by harrowing or tilling.
 - 3. Remove rocks and other objects over 2 inches in diameter.
 - 4. Correct irregularities in the ground surface resulting from soil preparation operations and slope to drain.
- C. Apply topsoil to a depth of four (4) inches in accordance with Section 207 of 2011 Edition Standard Specifications for Road and Bridge Construction by Colorado Department of Transportation.
- D. Inspection: Examine the substrate in which the work is to be performed. Do not proceed until unsatisfactory conditions have been corrected.
- E. Grades: Grades have been established under work of another Section to within 1 inch, plus or minus, of required finished grades. Verify that grades are within 1 inch, plus or minus, of required finished grades. Notify the ENGINEER prior to commencing soil preparation work if existing grades are not satisfactory, or assume responsibility for conditions as they exist.
- F. Weed and Debris Removal: All ground areas to be planted shall be cleaned of all weeds and debris prior to any soil preparation or grading work. Weeds and debris shall be disposed of off the site.
- G. Contaminated Soil: Do not perform any soil preparation work in areas where soil is contaminated with cement, plaster, paint or other construction debris. Bring such areas to the attention of the ENGINEER and do not proceed until the contaminated soil is removed and replaced.
- H. Moisture Content: Soil shall not be worked when moisture content is so great that excessive compaction will not occur, nor when it is so dry

that dust will form in the air or that clod will not break readily. Water shall be applied, if necessary, to bring soil to an optimum moisture content for tilling and planting.

- I. Ripping & Scarification: Rip, scarify, or otherwise loosen all areas to a depth of 6 inches, removing all obstructions encountered in excavating, such as loose rock, construction debris, etc. Thoroughly till all areas which are to be seeded that previously supported vehicular traffic to a depth of 12". Till all remaining areas to a depth of 6". Channel bottom areas are to be ripped to a depth of at least 2 feet on approximately 2- to 4-foot centers. Work the soil only when moisture conditions are suitable. Remove rocks and other objects 3" or greater in any dimension.
- J. Soil Conditioning: After soil preparation has been completed and high and low spots graded, add soil amendments as indicated above and rototill, making repeated passes with the cultivator to the depth specified until the amendments have been thoroughly mixed.

END OF SECTION

PART 1 – GENERAL

1.1 DESCRIPTION

- A. This section covers soil preparation, fertilizing, seeding, and mulching of areas disturbed by construction.
- B. Planting of seed shall be performed only when weather, soil conditions, and planting seasons are suitable as determined by professional horticulturists in accordance with local practice. Planting seasons shall be understood to comprise that period of time in the spring and fall, respectively, favoring the healthy growth of grass in the locality in which the seeding is to be done in accordance with accepted horticultural practice.
- C. All land where construction activities have obliterated or injured the existing vegetative ground cover shall be restored.

1.2 QUALITY ASSURANCE

- A. Source Quality Control: Manufacturer's test for purity and germination of seed, dated within six months of seeding.
- B. All seeding work shall be performed by a landscape contractor who is experienced and qualified in the work required and in utilizing equipment required to perform this work

1.3 SUBMITTALS

- A. Certificates: Manufacturer's certification that materials meet specification requirements.
- B. Test Reports: Results of seed purity and germination tests.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Do not deliver precast concrete sections until the concrete has attained at least 80 percent of its specified strength.

PART 2 – PRODUCTS

2.1 SEED

- A. Seed mix and application rates shall be as follows:

COMMON NAME	BOTANICAL NAME	LBS. PLS PER ACRE
Indian Ricegrass	<i>Achnatherum</i> <i>[Oryzopsis]</i> <i>hymenoides</i>	3.7
Sand Dropseed*	<i>Sporobolus cryptandrus</i>	0.1
4-Wing Saltbush	<i>Atriplex canescens</i>	2.7
Shadscale	<i>Atriplex confertifolia</i>	2
And At Least Two of the Following		
Salina Wildrye	<i>Leymus salinus</i>	1
Alkali Sacaton*	<i>Sporobolus airoides</i>	1
Western Wheatgrass	<i>Pascopyrum</i> <i>[Agropyron] smithii</i>	1.5
And at Least One of the Following		
Bottlebrush squirreltail	<i>Elymus elymoides,</i> <i>Sitanion hystrix</i>	2
Galleta	<i>Pleuraphis jamesii</i>	1
Purple Three-Awn	<i>Aristida purpurea</i>	1
TOTAL		Min – 11.5 Max - 13.0

- B. Seeding of the borrow site will be as directed by the OWNER. Seeding shall be a local native field seed mix as directed by the OWNER.

2.2 MULCH

- A. Straw only. 1.5 tons per acre. Apply to 3:1 slopes and flatter.

2.3 SOIL RETENTION COVER

- A. Install ST-2 or EX-2 grade erosion control blanket on all slopes meeting 3:1 or greater and moderate flow ditches as determined by the ENGINEER. Install within 24 hours of seeding.

PART 3 – EXECUTION

3.1 SOIL PREPARATION

- A. Verify soil preparation has been completed in accordance with Section 02934 – Soil Preparation.

3.2 SEEDING

- A. Apply by broadcasting or drilling at the rate specified herein.
 - 1. Rework previously prepared areas that have become compacted or damaged by rains or traffic.
 - 2. Do not drill or sow during windy weather or when ground is frozen or unfillable.
 - 3. Drill seed 0.25 inch to 0.5 inch into the soil. In small areas not accessible to a drill, hand broadcast or hydroseed at double the rate and rake 0.25 inch to 0.5 inch into the soil per CDOT subsection 212.
- B. Cover seed to depth between ¼ to ½ inch by raking or harrowing.
- C. Firm seeded areas with roller weighing maximum of 100 lbs per foot of width.

3.3 MULCHING

- A. Apply a minimum of 2 tons of certified weed free hay or 2 1/2 tons of certified weed free straw per acre and in accordance with CDOT Section 213, and mechanically crimp it into the soil in combination with an organic mulch tackifier.
- B. Prior to winter shutdown or the summer seeding window closure per CDOT Section 212: Uncompleted slopes shall be mulched with 2 tons of mulching (weed free) per acre, mechanically crimped into the topsoil in combination with an organic mulch tackifier per CDOT subsections 208 and 213.
- C. Apply "Soil Retention Cover" on slopes of 3:1 and steeper as per the "Standard Specifications" referenced above.

3.4 HYDRAULIC SEEDING AND MULCHING

- A. Due to high failure rates, hydroseeding will not be allowed for permanent stabilization.

3.5 SOIL CONDITIONING AND FERTILIZER REQUIREMENTS

- A. Minimum requirements for all disturbances to receive seeding (native). [Elevation: (4,520) feet:

Soil conditioner paid for as Item 212- Soil Conditioning (Acre)			
Biological nutrient organic based fertilizer (lbs/acre)*	Humate (lbs/acre)	Compost (cys/acre)	Spray on Amendment (lbs/acre)
		All areas <2:1	>2:1 slopes only
300	200	65	3500

*Biological nutrient shall not exceed 8-8-8 (N-P-K).

Humate based material shall be in accordance to Standard Special Provision 212 and compost shall be in accordance to CDOT Standard Special Provision 212.

3.6 RESEEDING AND REPAIR

- A. Reseed and mulch areas where there is not a satisfactory stand of grass at the end of one (1) year after seeding. Reseed and mulch a second time if a satisfactory stand of grass is not obtained one (1) year after the first reseeding and mulching.
- B. All seeded areas shall be reviewed during the fourteen (14) day inspections by the SWMP Administrator and or Erosion Control Inspector for bare soils caused by surface or wind erosion. Bare areas caused by surface or gully erosion, blown away mulch, etc. shall be re-graded, seeded, and have the designated mulching applied as necessary, at no additional cost to the project.
- C. Minimum satisfactory stand: 4 plants per square foot.

3.7 PRIOR TO FINAL ACCEPTANCE

- A. Partial Acceptance shall be in accordance with CDOT subsection 107.25 (d), 208.10 and 214.04 at the Partial Acceptance of the project, it shall be determined by the SWMP Administrator and the ENGINEER which temporary BMPs/Control Measures shall remain until 70% revegetation is established or which shall be removed.

END OF SECTION

DIVISION 3
CONCRETE

PART 1 – GENERAL

1.1 DESCRIPTION

- A. This Section covers furnishing, erecting and removing of forms for cast-in-place concrete.

1.2 QUALITY ASSURANCE

- A. Reference Standards.
1. American Concrete Institute Standards (ACI).
 - a. 301 Specifications for Structural Concrete for Buildings, Chapter 4, Formwork.
 - b. 347 Recommended Practice for Concrete Formwork (Chapters 1 through 5).
 - c. As modified herein.
- B. Design Criteria.
1. Design formwork for the loads, lateral pressure and allowable stresses outlined in Chapter 1 of ACI 347.
- C. Maximum Allowable Tolerances.
1. Variation from plumb.
 - a. Lines and surfaces of columns, piers and walls.
 - 1) In any 10 feet of length 1/4 inch
 - 2) Entire length 1 inch.
 - b. Exposed corner columns, control-joint grooves, and other conspicuous lines.
 - 1) In any 20 feet of length 1/4 inch.
 - 2) Entire length 1/2 inch.
 2. Variation from level or specified grade.
 - a. Slab soffits, beam soffits and ceilings.
 - 1) In any 10 feet of length 1/4 inch.
 - 2) In any bay or in any 20 feet of length 3/8 inch.
 - 3) Entire length 3/4 inch.
 3. Variation of the linear building lines from established position in plan and related position of columns, walls and partitions.
 - a. In any bay 1/2 inch.
 - b. In any bay or in any 20 feet of length 1/2 inch.
 - c. Entire length 1 inch.
 4. Refer to ACI 301, Table 4.3.1 for additional requirements.
 5. Forms for exposed surfaces shall produce finished surfaces that are free from offsets, ridges, waves and concave or convex areas. The maximum deviation from a true plane shall not exceed 1/8 inch in 6 feet.

PART 2 – PRODUCTS

2.1 FORM MATERIALS

- A. General: for concrete and cementitious coating finishes where "Smooth Form Finish", is specified, use prefabricated plywood panel forms, job-built plywood forms, forms lined with plywood or fiberboard, or steel forms. Where "Rough Form Finish" is specified, unlined wooden forms may be used. Earth shall not be used as a sideform.
- B. Steel Forms:
 - 1. Symons "Steel-Ply", Simplex "Industrial Steel Frame Forms", Universal "Uniform" or equal.
- C. Plywood forms:
 - 1. Product Standard PSI, - waterproof, resin-bonded exterior type Douglas fir.
- D. Fiberboard forms:
 - 1. Federal Spec. LL-B-810 - Type II tempered, waterproof, screenback, concrete form hardboard.
- E. Lumber:
 - 1. Straight, uniform width and thickness, free from knots, offsets, holes, dents, and other surface defects.
- F. Chamfer strips:
 - 1. Clear white pine, surface against concrete planed.
- G. Form ties:
 - 1. Removable end, permanently embedded body type.
 - 2. Sufficient strength and rigidity to support and maintain the form in proper position and alignment without the use of auxiliary spreaders.
 - 3. Breakback Cones:
 - a. 1" breakback cone ties with waterstops are required on below grade basins and pump rooms.
 - 4. Permanently embedded type without threaded ends shall be so constructed so that removable ends are readily broken off (one inch back from concrete surface) without damage to the concrete.
 - 5. Form ties in exposed surfaces shall be uniformly spaced and aligned in horizontal and vertical rows.
- H. Joints.
 - 1. Keyed joints in slabs on grade may be formed using 24 gage galvanized screed key joints of indicated slab depth and steel stake supports at 24 inch maximum centers.

- I. Wedge inserts.
 - 1. Malleable iron, with galvanized askew-head bolts, nuts and washers; Hohmann and Barnard "type HW"; Richmond Screw Anchor, "Peerless"; Weston Co., "WC 50", or equal.
- J. Polyethylene film:
 - 1. Product standard PS17; 8 mil.
- K. Form coating.
 - 1. Non-staining chemical release agent that will not damage the concrete surface.
 - 2. For all exposed surfaces not in contact with earth backfill use Protex Industries "Pro-Cote", Symons Corp., "Magic Kote", L & M "Debond" or equal.

2.2 ACCESSORIES

- A. Formliners
 - 1. General
 - a. Formliners shall mimic the wall sections of the headworks building. Split face formliner block shall be constructed to a height of 7' – 4" (Reference Drawing A301) and ground face formliner shall be constructed above the split face formliner to the top of the SBR basin walls.
 - 2. Materials
 - a. ABS Plastic, up to 15 reuses
 - 3. Split face formliner
 - a. Manufacturer
 - 1) Fitzgerald Formliners, Pattern 16971
 - 2) Or Equal
 - 4. Ground face formliner
 - a. Manufacturer
 - 1) Fitzgerald Formliners, Pattern 16949
 - 2) Or Equal

PART 3 – EXECUTION

3.1 ERECTION

- A. General.
 - 1. Erect forms substantial and sufficiently tight to prevent leakage of mortar and braced or tied to maintain the desired position, shape and alignment before, during and after concrete placement.
 - 2. Use adequate walers, stiffeners and braces to insure proper alignment.

3. Provide temporary openings at the bottom of column and wall forms and at other locations where necessary to facilitate cleaning and inspection.
4. Temporary openings in wall or column forms used to limit the free fall of concrete to a maximum of 4 feet shall be located to facilitate placing and compaction of the concrete. Such openings in walls shall not exceed 10 feet laterally to avoid moving concrete laterally more than 5 feet.
5. If tremies of proper lengths are used for depositing concrete in walls or columns, temporary openings for concrete placement will not be required.
6. Whenever the top of a wall will be exposed to weathering, do not extend the forms on one side above the top of the wall; bring to true line and grade.
7. At other locations, bring forms to a true line and grade, or provide a wooden guide strip at the proper location on the forms so that the top surface can be finished with a screed or template for concrete which is to have a specified elevation, slope or contour.
8. At horizontal construction joints in walls, do not extend the forms on one side more than 2 feet above the joint. When slab dowels project beyond face of forms, cut or drill forms to allow dowels to pass. Do not bend dowels to accommodate forming unless noted on drawings.
9. Flat segmental forms not more than 24 inches wide may be used for forming curved surfaces 25 feet in diameter or larger.
10. Where concrete is placed against rock, remove all loose pieces of rock and clean the exposed surface with a high pressure hose.

B. Embedded items.

1. Anchor bolts, castings, steel shapes, conduits, sleeves, masonry anchorage and other materials that are to be embedded in the concrete shall be accurately positioned in the forms and securely anchored.
2. In walls or slabs with reinforcement in both faces, install conduits between the two faces of reinforcing steel.
3. In slabs and wall which have only a single face of reinforcing steel, place conduits near the center of the slab.
4. Unless installed in pipe sleeves, provide anchor bolts with sufficient threads to permit a nut to be installed on the concrete side of the form or template.
5. Install a second nut on the other side of the form or template and adjust the two nuts so the bolt will be held rigidly in proper position.
6. Assure embedments are clean when installed.
7. After concrete placement, clean surfaces not in contact with concrete or concrete mortar and other foreign substances.

- C. Preparation of form surfaces.
1. Remove mortar, grout, and other foreign material from form surfaces.
 2. Coat form surfaces with form coating material before either the reinforcing steel or concrete is placed.
 3. Do not allow form coating to:
 - a. Stand in puddles in the forms.
 - b. Come in contact with the reinforcing steel or waterstops.
 - c. Come in contact with adjacent hardened concrete against which fresh concrete is to be placed.
- D. Edges and corners.
1. Place chamfer strips in forms to bevel all exposed edges and projecting corners. Chamfer the top edges of walls and slabs not indicated on the Drawings to be beveled.
 2. Form chamfered edges for all vertical and horizontal corners of equipment bases.
 3. Chamfer strips shall be 3/4 inch unless indicated otherwise on the Drawings.
- E. Removal.
1. Do not remove or disturb forms until the concrete has attained sufficient strength to safely support all dead and construction loads.
 2. For beams, slabs and similar sections determine strength from job cured cylinder breaks. Cylinders to be job cured in same manner as the formed concrete.
 3. Retain shoring in place and reinforce as necessary to carry any construction equipment, materials or other loads in excess of cured strength.
 4. Use care in form removal to avoid surface gouging, corner, or edge breakage, and other damage to concrete.
 5. Do not commence form removal earlier than the following schedule:
 - a. Walls not yet supporting loads: 24 hours
 - b. Vertical sides of beams and girders: 24 hours
 - c. Bottom forms and shoring for slabs under 10 feet clear span between supports: 7 days
 - d. Bottom forms and shoring for slabs between 10 to 20 feet clear span: 14 days
 - e. Bottom forms and shoring for slabs 20 feet clear span: 21 days
 - f. Refer to ACI 347, Chapter 2, paragraph 2.7.2.3. for additional requirements.
 6. In cold weather below 15 F, defer the removal of formwork or replace the formwork with insulation blankets to avoid thermal shock and consequent cracking of surface.

END OF SECTION

PART 1 – GENERAL

1.1 DESCRIPTION

- A. This Section covers furnishing and installing steel bars, dowel bar splicers, and welded wire fabric for concrete reinforcement.

1.2 QUALITY ASSURANCE

- A. Reference Standards:
1. American Concrete Institute Standards (ACI).
 - a. 301 Specifications for Structural Concrete for Buildings.
 - b. 315 Manual of Standard Practice for Detailing Reinforced Concrete Structures.
 - c. 318 Building Code Requirements of Reinforced Concrete.
 2. As modified herein or on the Drawings.
- B. Allowable tolerances.
1. Fabrication tolerances.
 - a. Sheared length: ± 1 inch.
 - b. Depth of truss: +0, -1/4 inch for concrete thickness 24 inches or less and +0, -1/2 inch for concrete thickness over 24 inches.
 - c. Overall dimensions of stirrups, ties and spirals: +0, -1/4 inch for concrete thickness 24 inches or less and +0, -1/2 inch for concrete thickness over 24 inches.
 - d. All other bends: ± 1 inch.

1.3 SUBMITTALS

- A. Shop Drawings.
1. Show sizes, quantity and dimensions for fabrication and placing of reinforcing bars and bar supports.
 2. Indicate bar schedules, stirrup spacing, and diagram of bent bars.
 3. Indicate concrete cover dimensions to concrete surface.
- B. Certificates.
1. Mill test certificates identifying chemical and physical analysis of each load of reinforcing steel delivered.
- C. Submit the following additional information for threaded dowels and threaded receivers.
1. Sizes, quantities, dimensions and locations.
 2. Type of rust inhibitive.
 3. Ultimate load test data for each size of bar.

4. Mill test certificate identifying chemical and physical analysis of the rebar material.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver to site in bundles marked with metal tags indicating bar size and length.
- B. Carefully handle and store on supports which will keep the steel from coming in contact with the ground.

1.5 ALTERNATIVES

- A. The use of straight or bent threaded dowel substitutes and their corresponding threaded receivers (structural anchor embeds), as shown are required as shown on Drawings, and may be provided at CONTRACTOR's option except in the following locations.
 1. Bottom vertical dowels in the exterior walls and the partition walls.
 2. Beams.
 3. Other locations designated by ENGINEER during construction.

PART 2 – PRODUCTS

2.1 REINFORCEMENT BARS

- A. Bars: ASTM A615, Grade 60 for #5 and larger bars, and grade 40 or grade 60 for #4 and smaller bars.
 1. Bend test: Meet 180 bend at 60 F minimum temperature without cracking when bent around pin diameter indicated.
 - a. Number 3, 4 and 5 bars around pin diameter equal to 4 times nominal bar diameter.
 - b. Number 6 through 11 bars around pin diameter equal to 5 times nominal bar diameter.
- B. Tie wire: Annealed steel, Fed. Spec. QQ-W-461, 16 gage minimum.
- C. Bar Supports:
 1. Conform to "Bar Support Specifications", CRSI Manual of Standard of Practice.
 2. Where concrete surface will be exposed to weather, the portions of the supports or accessories within ½ inch of the concrete surface shall be noncorrosive or protected against corrosion (plastic covered).
- D. Fabrication: in accordance with CRSI Manual of Standard Practice except for the allowable tolerances specified herein in 1.2B.

2.2 WELDED WIRE FABRIC

- A. Welded wire fabric: ASTM A 185 or A497.

2.3 THREADED DOWELS (ALTERNATIVE)

- A. Grade, same as under 2.1.A.
- B. Conformance: ACI 318.
- C. Develop a minimum of 125 percent of the specified yield strength of the reinforcing rebar shown on Drawings.
- D. Spacing: same as on Drawings.
- E. Manufacturers:
 - 1. Richmond Screw Anchor Co., Inc.
 - 2. Dayton Superior Corp.
 - 3. Erico Rebar Splicing.
 - 4. Lenton Formsaver
 - 5. No Substitutions allowed.

PART 3 – EXECUTION

3.1 PREPARATION

- A. Remove all mud, oil, loose rust or mill scale and other foreign materials that may reduce bond.

3.2 INSTALLATION

- A. Bar placement.
 - 1. Conform to CRSI-WCRSI "Placing Reinforcing Steel."
- B. Bar supports.
 - 1. Provide minimum number of supports as required by ACI 315.
 - 2. Do not use pebbles, pieces of broken stone, common or face brick, metal pipe or wood blocks to support reinforcement.
 - 3. Support at 4'-0 max centers unless otherwise shown.
 - 4. Use only plastic bar supports in basins and below grade structures.
- C. Placement tolerances.
 - 1. Clear distance to formed surface: see Drawings.
 - 2. Spacing between bars: -1/4 inch.
 - 3. Top bars in slabs and beams: see Drawings.
 - 4. Crosswise of members: spaced evenly within 2 inches.
 - 5. Lengthwise of members: \pm 2 inches.

6. Maximum bar movement to avoid interference with other reinforcing steel, conduits or embedded items: one bar diameter.
 - a. If bars are moved more than one bar diameter, or enough to exceed the above tolerances, the resulting arrangement of bars may be rejected by ENGINEER.

- D. Concrete cover.
 1. As indicated or scheduled on Drawings.

- E. Reinforcing adjustment.
 1. Move only as stated under 3.2 C 6.
 2. Do not heat, bend or cut bars without ENGINEER's approval.

- F. Splices.
 1. Do not splice bars except at locations shown on Drawings without ENGINEER's approval.
 2. Minimum lap distance shall be as shown on Drawings. If not shown, splices shall be as specified in ACI 318.
 3. Tie splices securely to prevent displacement during placement of concrete.

- G. Welded wire fabric.
 1. Install in longest practicable length.
 2. Lap adjoining pieces one full mesh plus 2 inches minimum.
 3. Do not make laps midway between simply supported members or directly over support members of continuous structures.
 4. Offset laps in adjacent widths to prevent continuous laps.
 5. Extend fabric through contraction joints and construction joints unless otherwise indicated on the Drawings.

- H. Threaded dowels, (Alternative).
 1. Receiver anchor embed: plug during concrete pouring.
 2. Threaded portion of the dowel: dip into rust inhibitive sealant, accepted by ENGINEER, before inserting into the receiver embed. The rest of the dowel in rebar should be clean, dry and clear of foreign material.

- I. Reinforcing Steel Ties
 1. Tie 50% of reinforced intersections at a minimum.

End of Section

PART 1 – GENERAL

1.1 DESCRIPTION

- A. This Section covers cast-in-place concrete, including furnishing materials, transporting, placing, finishing, curing and other appurtenant items of construction.
- B. Inform ENGINEER at least 48 hours in advance of time and places at which CONTRACTOR intends to place concrete, exclusive of weekends and holidays.

1.2 QUALITY ASSURANCE

- A. Reference standards
 - 1. Except as noted or modified in this Section all concrete materials, transporting, placing, finishing and curing shall conform to the requirements of the following standard specifications:
 - a. American Concrete Institute Standards (ACI).
 - 1) 301 Specifications for Structural Concrete for Buildings.
 - 2) 304 Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete.
 - 3) Committee 304 Placing Concrete by Pumping Methods.
 - 4) 305 Recommended Practice for Hot Weather Concreting.
 - 5) 306 Recommended Practice for Cold Weather Concreting.
 - 6) 309 Recommended Practice for Consolidation of Concrete.
 - 7) 318 Building Code Requirements for Reinforced Concrete.
- B. CONTRACTOR shall keep at least one copy of above listed ACI publications, latest edition, in project field office at all times.

1.3 SUBMITTALS

- A. Test results.
 - 1. Perform and submit test reports for following products in accordance with above general reference standards and specific standards of these specifications.
- B. Proposed mix design.

1. Prior to commencing concrete work submit and obtain ENGINEER's approval of certified test reports describing proposed concrete mix design, including:
 - a. Fine aggregates - source, type, gradation, deleterious substances and bulk specific gravity on basis of weight of saturated surface - dry aggregate. ASTM C128.
 - b. Coarse aggregate - source, type, gradation, deleterious substances and bulk specific gravity on basis of weight of saturated surface -dry aggregate, ASTM C127.
 - c. Ratio of fine to total aggregates.
 - d. Weight (surface dry) of each aggregate per cubic yard.
 - e. Total water content in gallons per cubic yard and proposed source.
 - f. Slump Range on which design is based.
 - g. Brand, type, and quantity of cement.
 - h. Brand, type, descriptive data, and quantity of admixtures.
 - i. Air content range.
 - j. Two sets of trial mix test cylinders, two cylinders per set, shall be made for each proposed mix or provide field experience basis for evaluation per ACI 301. Test one set of two cylinders at age 7 days and other set at 28 days.

- C. Cylinder Compression Test Reports
 1. Submit 2 copies of certified test reports to ENGINEER for 1.3 B.1.j. and 2 copies of each of test results required under 3.9A.

- D. Ready-Mix Delivery Tickets
 1. Submit delivery tickets for each load at time of delivery indicating following:
 - a. Quantity delivered.
 - b. Quantity of each material in batch.
 - c. Outdoor temperature in shade.
 - d. Time at which water was added.
 - e. Elapsed time between when water was added and concrete load was in place.
 - f. Amounts of initial and supplemental water added. Initial w/c ratio.
 - g. Name of individual authorizing supplemental water.
 - h. Numerical sequence of delivery by indicating cumulative yardage delivered on each ticket.
 - i. Mix temperature.

- E. Concrete Construction Jointing Plan
 1. Provide Construction Jointing Plan showing proposed location of wall, footing and slab locations prior to submitting reinforcing shop drawings.

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Cement
 - 1. Store in weather tight enclosures and protect against dampness, contamination and warehouse set.
 - 2. Do not use cement that has become caked or lumpy.
- B. Aggregates
 - 1. Stockpile to prevent excessive segregation, or contamination with other materials or other sizes of aggregates.
 - 2. Use only one supply source for each aggregates stock pipe.
 - 3. The bottom 6 inches of all aggregate piles in contact with ground shall not be used.
- C. Admixtures
 - 1. Store to prevent contamination, evaporation, or damage.
 - 2. Protect liquid admixtures from freezing or harmful temperature ranges.
 - 3. Agitate emulsions prior to use.
- D. Rubber and Plastic Materials
 - 1. Store in cool place away from direct sunlight.
- E. Mixing and transporting ready-mixed concrete
 - 1. Maximum elapsed time from time water is added to mix until concrete is in place shall not exceed 1 ½ hours when concrete is transported in revolving drum truck bodies.

1.5 JOB CONDITIONS

- A. Environmental Requirements
 - 1. Do not place concrete during rain, sleet or snow unless adequate protection is provided and ENGINEER's approval is obtained.
 - 2. Do not allow rain-water to increase mixing water or damage surface finish.

- B. Cold Weather Concreting
 - 1. Conform to ACI 306, "Recommended Practice for Cold Weather Concreting."
 - 2. Temperature of concrete when placed shall not be less than following:

Air Temp.	Minimum Concrete Temp. (°F).	
	Sections with least dimension	
	Under 12"	12" and Over
30 to 45	60	50
0 to 30	65	55
Below 0	70	60

3. When placed, heated concrete shall not be warmer than 80 F.
 4. Prior to placing concrete, all ice, snow, surface and subsurface frost shall be removed, and temperature of surfaces to be in contact with new concrete shall be raised to temperature specified for placing.
 5. Protect concrete from freezing during specified curing period.
 6. Heated enclosures shall be strong and windproof to insure adequate protection of corners, edges and thin sections.
 7. Do not permit heating units to locally heat or dry concrete.
 8. Do not use combustion heaters during first 24 hours unless concrete is protected from exposure to exhaust gases which contain carbon dioxide.
 9. Refer to ACI 306 for further requirements.
- C. Hot Weather Concreting - Conform to ACI 305, "Recommended Practice for Hot Weather Concreting".
1. Take precautions when ambient air temperature is 80 degrees F or above.
 2. Temperature of concrete when placed shall not exceed 85 degrees F.
 3. Cool forms and reinforcing to a maximum of 90 degrees F by spraying with water prior to placing concrete.
 4. Do not use cement which has reached a temperature of 170 degrees F or more.
 5. Prevent plastic shrinkage cracking due to rapid evaporation of moisture.
 6. Do not place concrete when evaporation rate (actual or anticipated) equals or exceeds 0.20 pounds per square foot per hour, as determined by Figure 2.1.4 of ACI 305.
 7. Set-retarding and water-reducing admixtures may be used with ENGINEER's approval when ambient air temperature is 90 degree F. or above to offset accelerating effects of high temperatures.
 8. Refer to ACI 305 for further requirements.
- D. Construction Joints
1. Divide wall pours into sections by construction joints (including contraction and expansion joints).
 2. If all construction joints are not shown on Drawings, limit all concrete pours as follows:
 - a. Limit wall pours to a maximum length of 60 feet.
 - b. Do not end wall pours at a corner.
 - c. Vertical wall construction joints shall be at least one-half the wall height in each direction from any corner.
 - d. Pour slab and beam arrangements monolithic.
 - e. Request for change in location of construction joints shown or called for, or the addition of such joints, shall be made by CONTRACTOR to ENGINEER before detailed

reinforcing drawings have been prepared by the steel fabricators.

3. Contraction and expansion joints as shown, detailed or called for on the Drawings.
- E. CONTRACTOR is solely responsible for the proper size and location of anchors, chases, recesses, openings, and embedded items required for the Work.

PART 2 – PRODUCTS

2.1 CONCRETE MATERIALS

- A. Cement: ASTM 150, Type II.
- B. Aggregates
 1. Fine aggregate - ASTM C33.
 2. Course aggregate - ASTM C33 except that air-cooled blast furnace slag will not be allowed.
 - a. Nominal maximum size of coarse aggregate shall not be larger than:
 - 1) 1/5 narrowest dimension between sides of forms, nor
 - 2) 3/4 inch minimum clear spacing between reinforcing bars, bundles or bars, minimum cover on form work for columns, beams, girders and walls.
 3. Aggregate for exposed aggregate surfacing.
 - a. 3/8" to 1/2" washed river gravel, free of silt, clay, organic material and salt.
- C. Water
 1. Clean, fresh and free from injurious amounts of oils, acids, alkalis, salts, organic materials, or other substances that may be deleterious to concrete reinforcement.
- D. Admixtures
 1. Use only as specified or approved in writing by ENGINEER.
 2. Do not use admixtures which cause accelerated setting of cement.
 3. Calcium chloride is not permitted.
 4. Air-entraining Agent: ASTM C260.
 5. Water-Reducing & Retarding: ASTM C494, Type D.
 6. Water Reducing: ASTM C494, Type A.
 7. Fly Ash: ASTM C618, Class F, with less than 5 percent ignition loss. Use less than 15 percent of cement quantity based upon 1.5 pounds of fly ash for each pound of cement reduction.

2.2 CONCRETE PRODUCTION

- A. Ready-Mixed Concrete
 - 1. Mixed and delivered, ASTM C94.
- B. Batching and Mixing Equipment
 - 1. "Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete", ACI 304.
- C. Concrete Classes
 - 1. Class A.
 - a. 4500 psi structural concrete mix.
 - b. To be used in all areas of the project (headworks process building, water retaining basins, and UV structure.) except as described for Class B.
 - c. Class A can be substituted for Class B if simplicity of pour dictates.
 - 2. Lean Concrete
 - a. Non-structural concrete mix
 - b. To be used for structure backfill
- D. Proportioning
 - 1. Proportion ingredients for Class A and Lean Concrete to produce a well-graded mix of high density and maximum workability consistent with approved mix designs as follows:

	<u>Class A</u>	<u>Lean</u>
a. Minimum 28- day Compressive Strength (psi):	4500	n.a.
b. Avg. 28-day strength if Production Plant does not have 30 consecutive strength tests for concrete proportions:	5200	n.a.
c. Minimum cement content:		
Cement bag/cubic yard:	7	0.5
Pounds/cubic yard:	615-660	50
d. Maximum water/cement ratio:		
-air entrained:	0.45	n.a.
e. Fine to total aggregate ratio:		
-3/4 inch coarse:	0.35-0.36	0.52
-larger than 3/4 inch:	0.35-0.36	-
 - 2. Entrained Air
 - a. Minimum for all structural concrete exposed to elements including all watertight structures containing water, $6\frac{1}{2}\pm 1\frac{1}{2}$ percent.
 - 3. Slump
 - a. Keep as low as possible consistent with proper handling and thorough compaction.

- b. Shall not exceed 5 inches for Class A and B and 2 inches for concrete fillet of Class C mix.
 - c. A tolerance of 1 inch above maximum will be allowed provided average for all batches or most recent 10 batches, whichever is fewer, does not exceed the maximum.
4. Mixing - Minimum time
- a. Central mixed concrete, 1 minute for mixer capacities of one cubic yard or less, plus 15 seconds for each cubic yard or fraction thereof of additional capacity.
 - b. Truck mixed concrete, 100 revolutions after introduction of all ingredients. Maximum 300 revolutions.
 - c. Do not place concrete until Resident has had the opportunity to check the load for air entrainment and slump requirements. He may exercise this right for any load he so chooses.
5. Temperature: Maximum of 85 degrees F.

2.3 CONCRETE ACCESSORY MATERIALS

- A. Curing Materials
- 1. Sheet material: ASTM C171.
 - 2. Liquid membrane: ASTM C309.
- B. Expansion Joint Filler. Shall comply with the following unless otherwise shown on Drawings.
- 1. Bituminous type: ASTM D994. (Preformed mastic)
 - 2. Cork type: ASTM D1752, Type 2 or 3.
 - 3. Fiber type: ASTM D1751.
 - 4. Sponge rubber type: ASTM D1752, Type I.
- C. Bond Break Material
- 1. Felt: ASTM D2475.
 - 2. Plastic: polyethylene sheet, Product Standard 17, 8 mil, use only where shown on Drawings.
- D. Joint Sealers
- 1. Shall comply with the following unless otherwise shown on Drawings:
 - a. Hot-poured elastic type: ASTM D1190.
 - b. Cold - application type: ASTM D1850.
 - c. Hydrostatic pressure resistant sealant: Sikaflex 427, or 405/406, or equal.
- E. Vapor Barrier Material.
- 1. Polyethylene sheet: 8 mil. thickness.
- F. Curing and Sealing Compounds.

1. Liquid membrane-forming: ASTM C309.
 2. Use Protex "Triple Seal," Castle Chemical Corp., "Klearseal," or equal.
- G. Water stops
1. Shall comply with the following unless otherwise shown on Drawings:
 - a. Material:
 - 1) Polyvinyl chloride, (PVC); Corps of Engineers, CRD-C-572.
 - 2) Waterstop Rx, 3/4" x 3/4" Butyl Rubber and Bentonite waterstop as manufactured by America Colloid Company, with Primer.
 - b. Type.
 - 1) Construction joints: dumbbell.
 - 2) Expansion joints: ribbed with center bulb.
 - c. Size.
 - 1) Six (6) inches wide, minimum.
 - 2) 3/8 inch thick, minimum.

PART 3 – EXECUTION

3.1 INSPECTION

- A. General.
1. Assure that excavations and form work are completed.
 2. Check that fill under slabs are of the type, depth and degree of compaction specified.
 3. Assure that dirt, mud, encrusted concrete, debris and excess water has been removed.
 4. Check that reinforcement is properly positioned and secured in place.
 5. Verify that expansion joint material, anchors, waterstops and other embedded items are secured in proper position. Waterstop Rx that has been wetted shall be removed and replaced with dry. Prime all concrete at waterstop Rx locations. Provide cut nails as necessary for secure installation.
 6. Verify that all required tests for pipes under slabs have been completed.
 7. Keyways are to be continuous and formed. No free hand keyways permitted.

3.2 PREPARATION

- A. General.
1. Remove any hardened concrete and foreign material from inner surface of conveying equipment.

2. Prepare slab subgrades in accordance with ACI 301, Chapter 11.
 3. Moisten subgrade prior to placement, but do not cause water to pond, nor muddy or soft spots to appear.
 4. Provide vapor barrier material under all floor slabs on grade. Lap edges and ends 4 inches and seal with 2 inch pressure-sensitive tape. Seal edges with pressure-sensitive tape at vertical surfaces.
 5. Designate limits of each placement and obtain ENGINEER's approval of entire installation prior to proceeding.
- B. Concrete placed against gravel or crushed stone.
1. Cover with 8 mil polyethylene film all surfaces that do not contain at least 25 percent material passing a No. 4 sieve to protect concrete from loss of water.
 2. Lap joints at least 4 inches.
- C. Concrete placed against rock.
1. Remove all loose pieces of rock.
 2. Clean exposed rock surface with high pressure water hosing followed by high air pressure hosing.
- D. Concrete placed against hardened or existing concrete.
1. Prior to placing fresh concrete against surface of hardened concrete, complete the following:
 - a. Roughen, air clean, and thoroughly wet hardened surface to sound concrete.
 - b. Remove all laitance, foreign substances (including curing compound), wash with clean water, and thoroughly wet hardened surface before placing fresh concrete.
 - c. If hardened concrete is in roughened condition, clean all loose material by high pressure water hosing in combination with stiff brooming.
 2. Omit coarse aggregate from mix when placing first batch or batches of fresh concrete against hardened horizontal concrete surfaces.
 - a. Cover hardened concrete with a mortar puddle to a depth of at least 2 inches at every point before continuing with normal mix of concrete.

3.3 PLACEMENT BASE SLABS/WALLS

- A. Placing sequence - To reduce the effect of shrinkage cracks, concrete for bottom and walls shall be placed as follows:
1. Slabs
 - a. Place outer thickened slab sections
 - b. Place inner sections alternately, first on one side and then on other side of previously poured sections.

- c. Schedule pours so that two adjacent sides of each section are free, except at closure.
 2. Walls.
 - a. Divide walls into sections by construction joints or expansion joints shown on Drawings or as noted in Joint Submittal.
 - b. Place section near center of each wall first.
 - c. Place sections alternately, first on one side and then on other side of previously place section.
 - d. Schedule pours so that one end of each section is free, except at closures.
 3. Do not place two abutting sections within 48 hours, unless otherwise authorized by ENGINEER.
 4. Changes in construction joint locations from that shown on Drawings must have ENGINEER's written approval.
- B. Conveying.
 1. Convey concrete from mixer to final position as rapidly as practicable without segregation or loss of material.
 2. Use only metal or metal lined chutes with maximum length of 20 feet, having a maximum slope of 1 vertical to 2 horizontal, and a minimum slope of 1 vertical to 3 horizontal.
 3. Provide a hopper at the end of long belt conveyors and chutes not meeting the requirements in 2 above.
 4. Conveying by pumping methods shall conform to ACI 304, Chapter 9.
 - a. Maximum loss of slump, 2 inches.
 - b. Do not pump concrete having a slump of less than 2 inches.
 - c. Do not use aluminum or aluminum alloy pipe to convey concrete.
- C. Depositing.
 1. Deposit concrete in a continuous operation until section is completed.
 2. Regulate rate of placement so concrete remains plastic and flows into position.
 3. In walls place concrete in approximately horizontal layers 18 inches maximum depth for liquid containing structures and 24 inches for all other structures.
 4. Each layer of concrete shall be plastic when covered with following layer.
 5. Provide vertical joints as necessary to comply with these requirements.
 6. Maximum height of concrete free fall, 4 feet.
 7. Use a tremie for placing concrete in drilled piers and walls to prevent free fall of more than 4 feet. Do not allow concrete to

fall on reinforcement or other objects that would cause segregation.

8. Tremies shall have varying lengths to limit free fall of concrete to 4 feet at all times.
9. Place and compact concrete in wall or column forms before any reinforcing steel is placed in the system to be supported by such wall or column.
10. Do not exceed 6 feet of vertical height for any portion of wall or column placed monolithically with floor or roof slabs.
11. Concrete in walls or columns shall settle at least 2 hours before concrete is placed in structural systems to be supported by such walls or piers.
12. Allow concrete to thoroughly settle before top is finished.
 - a. Remove all laitance, debris, and surplus water from surfaces at tops of forms by screeding, scraping, or other effective means.
13. Overfill forms wherever top of a wall will be exposed and screed off excess concrete after settlement has occurred. Forms may be extended above top of wall by 2 feet provided work conforms to the requirements of the preceding paragraph 12.
14. No concrete shall be placed in water except with the written permission of the ENGINEER.

D. Consolidation.

1. During and immediately after placement, thoroughly vibrate and work around all reinforcements, embedments, and corners of forms, as recommended by ACI 309.
2. Use mechanical vibrators that will maintain at least 9000 cycles per minute when immersed in concrete.
3. Minimum horsepower per vibrator shall be 1 1/2.
4. Number and type of vibrators shall be acceptable to ENGINEER.
5. Do not use vibrators to transport concrete laterally in forms.
6. Vertically insert vibrators at points approximately 18 inches apart and to a depth to penetrate 6 inches into the preceding layer.
7. Vibrate each location for a length of time to obtain adequate consolidation (generally 5 to 15 seconds).

3.4 JOINTS

A. Watertight joints.

1. Provide waterstops at locations shown on Drawings.
2. Provide waterstops in wall and slabs that form a part of an interior room or dry pit which will be in contact with earth or liquid.

B. Expansion and contraction joints.

1. At all locations shown on Drawings and at all construction joints for water containing basins.

2. Do not extend reinforcement continuously through joint unless specifically shown on Drawings.
 3. Form joint with felt, ASTM D2475, extending full depth, where "break bond" or "isolation" joint is indicated.
 4. Use sponge rubber type filler where in contact with liquid.
 5. Provide expansion joints where walks abut structures.
- C. Construction joints.
1. Where shown on Drawings.
 2. Obtain ENGINEER's approval for location of construction joints not shown on Drawings.
 3. Locate joints as follows:
 - a. Columns and walls.
 - 1) At underside of beams, girders, haunches, drop panels.
 - 2) Column bases will not be required to be monolithic with floor beneath.
 - b. Beams and girders.
 - 1) Construction joints will not be allowed.
 - c. Suspended slabs.
 - 1) At or near center of span in flat slab or T-beam construction or centered over wall.
 - 2) No joint will be permitted between a slab and a concrete beam or girder unless specifically shown on Drawings.
 - d. Construction joints in walls and slabs shall be perpendicular to planes of their surfaces.
 4. If all construction joints are not shown on Drawings, limit all concrete pours as follows:
 - a. Limit wall pours to a maximum length of 60 feet.
 - b. Do not end wall pours at a corner.
 - c. Vertical wall construction joint shall be at least one-half the wall height in each direction from any corner.
 - d. Request for change in location of construction joints shown, or the addition of such joints, shall be made by CONTRACTOR to ENGINEER before detailed reinforcing drawings have been prepared by the steel fabricators.

3.5 EMBEDDED ITEMS

- A. Refer to Section 03100-Concrete Formwork.
- B. Waterstops.
 1. Place in construction and expansion joints as indicated on Drawings.
 2. Waterstops shall be continuous in each joint.
 - a. Splice as recommended by manufacturer.
 - b. Splices shall be watertight.

- c. Thoroughly clean water stops of foreign material before splicing or placing concrete.
 - d. Splices shall be neat with the ends of the joined materials in true alignment.
3. Install with an approximately equal width of material embedded in concrete on each side of the joint.
 4. Provide suitable guards to protect exposed projecting edges and ends of partially embedded water stops for mechanical damage when concrete placement has been discontinued.
 5. Carefully place and vibrate concrete around water stops to ensure the following: maximum concrete imperviousness and density, the complete filling of the forms in the vicinity of the waterstop, and complete contact between the concrete and all surfaces of the waterstop.
 6. Make adequate provision to support and completely protect the waterstops in proper position during the progress of the Work and take particular care for their protection during form removal. Water stops shall be wired to reinforcing when possible to maintain alignment.
 7. Replace or repair punctured or otherwise damaged waterstops.
 8. Waterstops are to be in center of keyway unless detailed otherwise.

3.6 FINISHING EXPOSED SURFACES

- A. Finishing unformed surfaces.
 1. Slabs, floors, stairs, pavements, sidewalks, driveways, curb and gutters, and similar structures.
 - a. Provide surface conforming to proper elevation and contour with all aggregates completely embedded in mortar by screening.
 - 1) Screened surfaces shall be free of surface irregularities.
 - 2) Maximum variation from level in any 10 feet section, $\pm 1/4$ inch.
 - b. Provide an initial float finish as soon as concrete has stiffened sufficiently for proper working.
 - 1) Remove any piece of coarse aggregate which is disturbed by float or which causes a surface irregularity and replace with mortar.
 - 2) Produce a surface of uniform texture and appearance with initial floating, without unnecessary working of surface.
 - c. Provide a second floating at time of initial set.
 - 1) Produce a finish of uniform texture and color with second floating.

- 2) Float finish produced by second floating shall be completed finish unless additional finishing is specifically required and specified.
- 3) Perform floating with hand floats or suitable mechanical compactor-floats.
- d. Follow second floating with a broomed treatment to surface to provide a uniform abrasive texture of constant color, in areas where concrete is to remain exposed.
 - 1) Broom at right angles to normal traffic direction.
 - 2) Broom exterior concrete stairs, sidewalks, driveways, curb and gutters, pavements and exterior decks and slabs.

B. Troweling.

- 1. Steel trowel finish following surfaces:
 - a. Exposed interior floor surfaces after construction is completed.
 - b. Surfaces to be covered with resilient floor covering or thinset terrazzo.
 - c. Exposed portion of top of equipment bases.
 - d. Top of interior curbs.
 - e. Other surfaces that may be designated on Drawings.
 - f. Steel trowel finish will not be required for slabs normally submerged.
 - g. Headworks Slabs
 - h. Chemical storage areas and basins
- 2. Perform steel troweling after second floating when surface has hardened sufficiently to prevent excess of fines being drawn to surface.
 - a. Produce a dense, smooth, uniform surface free from blemishes and trowel marks.
 - b. Power or hand steel trowel surface to smooth finish with a tolerance of $\pm 1/4$ inch in 10 feet.
 - c. Hand trowel areas inaccessible to power trowel.

C. Finishing surfaces for bonding.

- 1. Float finish all surfaces to be covered with concrete topping.
- 2. Remove by brushing or air blasting at time of initial set, all laitance, surface mortar, and unsound material.
- 3. Surfaces shall be rough, clean, and sound.

- D. Edging.
 - 1. Edge exposed edges of floated or troweled surfaces with a tool having 1/4 inch corner radius, unless these edges are specified to be beveled.

3.7 CURING

A. General.

- 1. Keep concrete continuously moist for at least 7 days after placement by use of:
 - a. Ponding or continuous sprinkling.
 - 1) Begin as quickly as possible after initial set.
 - 2) Provide complete coverage with minimum of runoff by regulating rate of water application.
 - 3) Interrupt application of water to wall for grout cleaning only over areas being cleaned.
 - 4) Do not permit wall areas to become dry which are not being grout cleaned.
 - b. Wet burlap, wet absorptive mats, wet sand, polyethylene sheeting, or membrane curing compound.

B. Membrane curing compound.

- 1. May be used in lieu of water curing on concrete which will not be covered later with topping, mortars, additional concrete, paint, or adhesive attached flooring.
- 2. Spray apply at coverage recommended by manufacturer.
- 3. Cover unformed surfaces with curing compound within 30 minutes after final finishing.
- 4. Apply curing compound immediately to formed surfaces if forms are removed before end of specified curing period.
- 5. Protect compound against abrasion during curing period.

C. Film Curing.

- 1. Film curing with polyethylene sheeting may be used in lieu of water curing on concrete which will be covered later with mortar or additional concrete, or will otherwise be covered or hidden from view.
- 2. Begin as quickly as possible after initial set of concrete.
- 3. Cover surfaces completely with polyethylene sheeting.
- 4. Overlap edges for proper sealing and anchorage.
- 5. Seal joints between sheets.
- 6. Promptly repair all tears, holes and other damage.
- 7. Anchor continuously all edges and anchor surface as necessary to prevent billowing.

3.8 FINISHING FORMED SURFACES

A. Repair of defective concrete.

1. Repair, to satisfaction of ENGINEER, within 24 hours after removal of forms, all defects in concrete surfaces.
 2. Replace, to satisfaction of ENGINEER, within 48 hours after adjacent forms have been removed, all defective concrete.
 3. Cut out and remove to sound concrete, with edges square cut to avoid feathering, all honeycombed or otherwise defective concrete.
 4. Repair work shall conform to Chapter 9, ACI 301.
 5. Perform in a manner that will not interfere with thorough curing of surrounding concrete.
 6. Adequately cure all repair work.
- B. Finishing.
1. Rough form finish - All concrete surfaces not exposed to view and in contact with earth from 1 foot below finish grade. Finish is accomplished by the following:
 - a. Remove all fins and other surface projections when damp proofing is specified.
 - b. Provide a flush surface and use a power grinder, if necessary, to remove fins and projections.
 - c. Fill all tie holes with patching mortar.
 - d. Tar contraction cracks, construction joints and tie holes below finish grade on the side exposed to earth if inside is a dry room.
 2. Smooth form finish - Use smooth form on all surfaces except rough form areas described above. Finish to be accomplished by the following:
 - a. Use form facing to produce a smooth, hard, uniform surface.
 - b. Keep number of seams to a minimum.
 - c. Remove all fins and projections.
 - d. Clean, wet, and fill all tie holes with patching mortar.
 - e. Repair and patch all defects including honeycombs.
 3. Smooth form finish can be substituted for rough form.
 4. Basin floors.
 - a. Accurately finish to a uniformly slope.
 - b. Conform to ACI Committee 117 tolerance $F_F 25$ (approximate variation from level in any 10 foot section, $\pm 1/4"$).
 5. Floor sealer.
 - a. Provide two coats of clear floor sealer in addition to any membrane curing compound to all floors subject to foot traffic and which are not required to be covered with any type of final floor covering.
 - b. Apply first coat at end of curing period and before any traffic is permitted.
 - c. Apply second coat after floor has been cleaned in preparation for final inspection.

- d. Apply in strict accordance with manufacturer's recommendations.

3.9 QUALITY CONTROL

A. Concrete tests.

- 1. Shall be in accordance with requirements of ACI 301, Chapter 16 - Testing, except as noted or modified in this Section.

- a. Strength test.

- 1) Mold and cure three cylinders from each sample.
- 2) Test one at 7-days for information and two at 28-days for acceptance.

- b. Minimum samples.

- 1) Collect the following minimum samples for each 28-day strength concrete used in the Work for each days placing:

<u>Quantity</u>	<u>Number of Samples</u>
50 cubic yards or less	2
50 to 100 cubic yards	4
100 cubic yards or more	4 plus 1 sample for each additional 50 cubic yards

- c. Sample marking.

- 1) Mark or tag each sample of compression test cylinders with date and time of day cylinders were made.
- 2) Identify location in Work where concrete represented by cylinders was placed.
- 3) Identify delivery truck or batch number, air content, and slump.

- d. Slump test.

- 1) Conduct test for each strength test sample and whenever consistency of concrete appears to vary.

- e. Air content.

- 1) Conduct test from one of first three batches mixed each day and for each strength test sample.

B. Acceptance of concrete.

- 1. Strength level of concrete will be considered satisfactory so long as average of all sets of three consecutive strength test results equals or exceeds specified 28-day strength and no individual strength test result falls below specified strength by more than 500 psi.

C. Failure of test cylinder results.

1. Upon failure of test cylinder results, ENGINEER may require CONTRACTOR, at his expense, to obtain and test at least three 2-inch diameter cored samples from area in question.
 - a. Conform to ASTM C42.
 2. Concrete will be considered adequate if average of three cores is at least 85% of, and if no single core is less than 75% of specified 28-day strength.
 3. Upon failure of core test results, ENGINEER may require CONTRACTOR, at his expense, to perform load tests as specified in ACI 318, Chapter 20.
 4. Fill all core holes as specified for repairing defective concrete.
- D. Effluent Box Leakage Tests
1. Visible leaks shall be repaired by chemical grout or epoxy infection.
 2. CONTRACTOR shall submit products and procedures to the ENGINEER for acceptance prior to performing repair work.

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This Section covers sand-cement grout, nonshrink-nonmetallic grout, grout epoxy, bonding agent epoxy, and where each is to be used.
- B. Grouting is required for the following, but is not necessarily limited to the items listed.
 - 1. Pump, motor, and equipment baseplates, pedestals, or bedplates
 - 2. Column baseplates
 - 3. Motor control center bases
 - 4. Other miscellaneous baseplates
 - 5. Grouted cells in concrete masonry walls if not specified otherwise under masonry sections of these Specifications
 - 6. Stop gate keyouts
 - 7. Slide gate frames
 - 8. Anchor bolts
 - 9. Reinforcing bars in existing hardened concrete
 - 10. Watertight structures where walls join tank bottoms or hardened concrete floors
 - 11. Openings in cast-in-place or precast concrete sections where cast-in-place walls are constructed around openings
 - 12. Open or closed channel fillets
 - 13. Fillets required for equipment installed
 - 14. Structural floors when called for on Drawings
 - 15. Grout inside joints of 48" RCP
 - 16. Other grout uses as shown or called for on Drawings

1.2 SUBMITTALS

- A. Submit complete Shop Drawings on premixed grout products in accordance with Section 01340.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Grout, Sand-Cement: 2 inches or more in thickness
 - 1. Portland cement: ASTM C150, Type IIA
 - 2. Fine aggregate: ASTM C33, clean, well-graded natural sand
 - 3. Coarse aggregate: ASTM C33, 90 percent passing ½ inch sieve, 90 percent retained on a No. 3 sieve
 - 4. Ratio of fine and coarse aggregate: 50 percent of each by

- 5. volume.
- 5. Water: clean and free from deleterious substances
- B. Grout, Sand-Cement: less than 2 inches in thickness
 - 1. Portland cement: ASTM C150, Type IIA
 - 2. Fine aggregate: ASTM C33, clean, well-graded natural sand
 - 3. Water: clean and free from deleterious substances
- C. Grout, Nonshrink-Nonmetallic: Compounds must conform to CRD-C-621
 - 1. Furnish products factory premixed and requiring only the addition of water
 - 2. Master Builders, "Masterflow 713 Grout"
 - 3. Sika Corp., Sikagrout 212
 - 4. L&M Construction Chemicals "Crystex"
 - 5. Sonneborn-Contech, "Sonogrout"
 - 6. Water: clean and free from deleterious substances.
- D. Epoxy Grout
 - 1. Manufacturers
 - 2. Sika Chemical Corporation, Sikadur 32, HiMod
 - 3. The Euclid Chemical Company, designed specifically for this purpose
 - 4. L&M Construction Chemicals "Epogrout"
- E. Adhesive Anchor
 - 1. Hilti RE 500-SD
 - 2. Simpson ET-HP
 - 3. Sika AnchorFix-3001
- F. Epoxy Bonding Agent
 - 1. Manufacturer
 - 2. Sika Chemical Corporation, Sikadur 32; Hi-Mod
 - 3. The Euclid Chemical Company, designed specifically for this purpose
 - 4. L&M Construction Chemicals "Epobond"

PART 3 - EXECUTION

3.1 PREPARATION

- A. Grout, Sand-Cement: 2 inches or more in thickness
 - 1. Mix: One part Portland cement, 2½ parts of aggregate (50 percent fine and 50 percent coarse) by volume, with sufficient water for placement and hydration.
 - 2. Mix grout in a mechanical mixer.
 - 3. Use as little water as possible for steep grout fillets.
 - 4. Saturate concrete to receive grout with clean water for 24 hours

prior to grouting.

- B. Grout, Sand-Cement: less than 2 inches in thickness
 1. Mix: One part Portland cement, 2½ parts of fine aggregate by volume, with sufficient water for placement and hydration.
 2. Mix grout in a mechanical mixer.
 3. Use no more water than is necessary to produce a flowable grout.
 4. Saturate concrete to receive grout with clean water for 24 hours prior to grouting.

- C. Grout, Nonshrink-Nonmetallic
 1. Mix and place in strict accordance with directions and instructions of manufacturer.
 2. Fill spaces and cavities below top of baseplates, bedplates, column baseplates, and other areas requiring grouting.
 3. Leave no voids.
 4. Provide forms where structural components of baseplates or bedplates will not confine grout.

- D. Grout, Epoxy and Bonding Agent, Epoxy.
 1. Mix and place in strict accordance with recommendations and instructions of manufacturer.

3.2 LOCATIONS OF USE

- A. Where type of grout is not designed on Drawings, the following schedule will apply.

- B. Grout, Sand-Cement as listed in 2.1.A or 2.1.B
 1. Openings in cast-in-place or precast concrete sections when short cast-in-place walls or curbs are constructed around openings.
 2. Open or closed channel fillets.
 3. Similar fillets before, after or within certain equipment pieces.
 4. Motor control center bases if not poured prior to motor control centers being in final position.
 5. Bottom structural floors of water containing structures.
 6. Other grout locations called for on Drawings and where nonshrink-nonmetallic or epoxy grout is not necessary.

- C. Grout, Nonshrink-Nonmetallic
 1. Pump, motor, and equipment baseplates, pedestals or bedplates.
 2. Stop plate keyouts.
 3. Sluice gate and slide gate frames.
 4. Anchor bolts.
 5. Patching of spalled concrete, floors and walls.
 6. Pipe penetrations
 7. Stop plate keyouts.

8. Column baseplates.
 9. Other items or areas requiring nonshrink, nonmetallic grout.
- D. Grout, Epoxy
1. Use when setting reinforcing rods into existing hardened concrete.
 2. Bonding Agent, Epoxy
 3. Use when pouring fresh concrete against existing hardened concrete.

3.3 FINISHING AND CURING

- A. Edge Finishing
1. Finish smooth edges exposed to view after grout has reached initial set.
 2. Cut edges flush at baseplate, bedplate, or piece of equipment, except where shown to be finished on a slope.
- B. Curing
1. Protect against rapid loss of moisture by covering with rags kept wet or polyethylene sheets.
 2. Wet cure for at least 7 days after edge finishing is completed.
 3. Coat with manufacturer recommended curing agent.
- C. Follow manufacturer's recommendations where applicable.

END OF SECTION

DIVISION 4
MASONRY

DIVISION 5
METALS

PART 1 – GENERAL

1.1 SCOPE

- A. This Section covers cast-in-place anchor bolts, epoxy grouted anchor bolts, threaded rod anchors, adhesive anchors, and expansion anchors to be installed in hardened concrete and masonry.
- B. Adhesive for the adhesive anchors is specified herein. Epoxy grouting of anchor bolts and threaded rod anchors is covered in the grout section.

1.2 GENERAL

- A. Unless otherwise specified or indicated on the Drawings, all anchor bolts shall be cast-in-place bolts, shall have a diameter of at least 3/4 inch, and shall be straight-headed, straight with embedded nut with or without a plate, or L-shaped. Epoxy grouted anchor bolts, threaded rod anchors which are epoxy grouted, and adhesive anchors indicated or accepted instead of cast-in-place anchor bolts for equipment or structural framing shall be at least 3/4 inch in diameter. All cast-in-place anchors in grout-filled masonry shall be at least 1/2 inch but not more than 3/4 inch in diameter. All expansion anchors shall be at least 1/2 inch in diameter.
- B. Anchor bolts and threaded rod anchors for buried service and in splash zones shall be hot-dip galvanized. Anchor bolts, threaded rod anchors, adhesive anchors, and expansion anchors for immersed service shall be stainless steel. Expansion anchors and adhesive anchors for buried service and in splash zones shall be stainless steel. All other anchor bolts, threaded rod anchors, adhesive anchors, and expansion anchors shall be carbon steel unless otherwise specified or indicated on the Drawings.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Anchor Bolts and Nuts
 - 1. Carbon Steel ASTM A307
 - 2. Stainless Steel Bolts, ASTM F593, Alloy Group 1 or 2; nuts, ASTM F594, Alloy Group 1 or 2.
 - 3. Galvanized Steel Carbon steel bolts and nuts; hot-dip galvanized, ASTM A153 and A385.
- B. Threaded Rod Anchors and Nuts
 - 1. Carbon Steel ASTM A307 or A36.
 - 2. Stainless Steel Bolts, ASTM F593, Alloy Group 1 or 2; nuts, ASTM F594, Alloy Group 1 or 2.
 - 3. Galvanized Steel Carbon steel bolts and nuts; hot-dip galvanized, ASTM A153 and A385.

- C. Adhesive Anchors (for concrete)
 - 1. System:
 - Hilti "HIT HY150 System", ITW Ramset /Redhead "C6 epoxy adhesive", or Rawlplug "R-KEM" metnacrylate resin system.
 - a. Threaded Rod Anchors and Nuts: Hilti HSE 2421 High Strength Epoxy.
 - b. Adhesive: Two-component liquid, moisture-insensitive epoxy adhesive with viscosity appropriate for the location and application.
- D. Flat Washers: ANSI B18.22.1; of the same material as anchor bolts and nuts.
- E. Expansion Anchors for Concrete:
 - Hilti "Kwik-Bolt 3", ITW Ramset/Red Head "Trubolt Wedge Anchor", or Rawlplug "Rawloct".
- F. Reinforcing Bars: ASTM A615, Grade 60, deformed.

PART 3 – EXECUTION

3.1 ANCHORS

- A. Anchor bolts shall be cast in place and, when acceptable to the ENGINEER or indicated on the Drawings, may be epoxy grouted anchor bolts, threaded rod anchors, or adhesive anchors. Anchor bolts, threaded rod anchors, and adhesive anchors which are to be epoxy grouted shall be clean and free of coatings that would weaken the bond with the epoxy.
- B. Two nuts, a jam nut, and a washer shall be furnished for anchor bolts, threaded rod anchors, and adhesive anchors indicated on the Drawings to have locknuts; two nuts and a washer shall be furnished for all other anchor bolts, threaded rod anchors, and adhesive anchors.
- C. Anti-seize thread lubricant shall be liberally applied to projecting, threaded portions of stainless steel anchor bolts, threaded rod anchors, and adhesive anchors immediately before final installation and tightening of the nuts.
- D. Anchor Bolts. Anchor bolts shall be delivered in time to permit setting before the structural concrete is placed. Anchor bolts which are cast in place in concrete shall be provided with sufficient threads to permit a nut to be installed on the concrete side of the concrete form or the supporting template. Installation of anchor bolts is covered in the cast-in-place concrete section.
- E. Threaded Rod Anchors. When acceptable to the ENGINEER, threaded rod anchors may be used in locations where cast-in-place anchor bolts are

specified. Adhesive for threaded rod anchors shall be as specified in the grout section. The embedment depth for threaded rod anchors shall be at least fifteen (15) rod diameters.

- F. Adhesive Anchors. When adhesive anchors are indicated on the Drawings, only an acceptable adhesive anchor system shall be used. Alternative anchoring systems may be used only when acceptable to the ENGINEER. An acceptable adhesive anchor system may be used as an alternative in locations where epoxy grouted anchor bolts and threaded rod anchors are specified or indicated. The embedment depth for adhesive anchors shall be at least fifteen (15) rod diameters.
1. Adhesive for adhesive anchors shall be statically mixed in the field during application. All proportioning and mixing of the components shall be in accordance with the manufacturer's recommendations.
 2. When acceptable to the ENGINEER, adhesive anchors shall be anchored in holes drilled into hardened concrete or grout filled masonry. Diameter of holes shall be 1/16 inch larger than the outside diameter of the rod. Holes shall be prepared for of the anchors by removing all dust and debris using procedures recommended by the adhesive manufacturer.
 3. Adhesive anchors and holes shall be clean, dry, and free of grease and other foreign matter at the time of installation. The adhesive shall be placed, the rods shall be set and positioned, and the adhesive shall be finished, all in accordance with the recommendations of the material manufacturer. Care shall be taken to ensure that all spaces and cavities are filled with adhesive, without voids, and remain filled with adhesive until completion of the curing period. Adhesive shall be cured in accordance with the recommendations of the adhesive manufacturer.

3.2 EXPANSION ANCHORS.

- A. When expansion anchors are indicated on the Drawings, only an acceptable expansion anchor shall be used. Alternative anchoring systems may be used only when acceptable to the ENGINEER. Expansion anchors shall be installed in conformity with the manufacturer's recommendations for maximum holding power, but in no case shall the depth of the hole be less than six bolt diameters. The minimum distance between the center of any expansion anchor and an edge or exterior corner of concrete shall be at least six (6) times the diameter of the bolt. Unless otherwise indicated on the Drawings, the minimum distance between the centers of expansion anchors shall be at least twelve (12) times the diameter of the bolt.
- B. Nuts and washers for expansion anchors shall be as specified for anchor bolts. Anti-seize thread lubricant shall be liberally applied to threaded stainless steel components of expansion anchors immediately before installation.

END OF SECTION

DIVISION 6
WOOD AND PLASTIC

DIVISION 7
THERMAL AND MOISTURE
PROTECTION

DIVISION 8
DOORS AND WINDOWS

DIVISION 9
FINISHES

DIVISION 10
SPECIALTIES

DIVISION 11
EQUIPMENT

PART 1 - GENERAL

1.1 DESCRIPTION

A. General

1. The work of this Section consists of material specifications and installation of the Diffuser Structure within the Colorado River in accordance with the project Drawings.

B. Related sections include but are not limited to:

1. Section 02300 - Earthwork and Trenching
2. Division 3 – Concrete

1.2 SUBMITTALS

The following documents must be submitted in their entirety within one (1) complete package; submittal packages not including all of these items will be deemed incomplete and rejected without review:

- A. Product literature that includes information on the performance and operation of the valve, materials of construction, dimensions and weights, elastomer characteristics, and pressure ratings.
- B. Diffuser Dimensional Drawing – the drawing shall be a scaled version of the actual nozzle, generic Drawings with listed dimensions or will not be accepted.
- C. Hydraulic curves for each inlet nozzle showing headloss, jet velocity, and effective open area all versus flow rate. The hydraulic curves must accurately reflect the variable orifice characteristics inherent to duckbill valves. The backpressure rating of diffuser shall be indicated.
- D. Verification of Independent Laboratory Testing for Manufacturing Consistency - the nozzle manufacturer shall provide summary documentation of a report conducted by an Independent laboratory for hydraulic testing where multiple nozzles (at least four) of the same size and construction (stiffness) were tested to validate the submitted headloss characteristics and to prove the repeatability and consistency of the manufacturing process to produce the same hydraulic characteristics.
- E. Verification of Finite Element Analysis (FEA) - the nozzle manufacturer shall provide summary documentation of Finite Element Analysis modeling on representative duckbill nozzle sizes to determine deflection, stress and strain characteristics under various load conditions. Modeling must have been done for flowing conditions (positive differential pressure) and

reverse differential pressure.

- F. Report of independent testing that studied the flow distribution characteristics of duckbill valves installed on multiport manifolds. The manufacturer must have been in the business of manufacturing duckbill valves at the time the report was published.
- G. Report of independent testing that studied the initial dilution characteristics of duckbill valves. The manufacturer must have been in the business of manufacturing duckbill valves at the time the report was published.

1.3 QUALITY ASSURANCE

- A. Supplier shall have at least 15 years experience in the manufacture of "duckbill" style elastomeric valves, and at least ten (10) years experience with diffuser applications, and shall provide references and a list of installations upon request.
- B. The duckbill valve manufacture must have a registered Professional ENGINEER on staff whom, at the ENGINEER and/or OWNER's discretion, may be interviewed to discuss the submittals and technical knowledge of the hydraulic characteristics of variable orifice duckbill valves as they apply to the critical hydraulic operation and initial dilution characteristics of the outfall diffuser.

PART 2 - PRODUCTS

2.1 "Duckbill" ELASTOMERIC DIFFUSER VALVES

- A. The Flanged Diffuser Check Valves are to be all rubber and the flow operated check type fabricated integrally with a wire-reinforced riser. The port area shall contour down to a duckbill, which shall allow passage of flow in one direction while preventing reverse flow. The flange, riser, and Duckbill Diffusers shall be one-piece rubber construction with nylon reinforcement.
- B. The integral riser shall consist of an elastomer inner tube, a fabric reinforced body section with a helical wire reinforcement embedded in the body. The riser shall be covered with a synthetic rubber cover stock for protection against abrasion and gouging.
- C. The linear bill slit dimension to nominal valve size ratio shall be greater than 2.0.
- D. The flange drilling shall conform to ANSI B16.1 Class 125/ANSI B16.5, Class 150 standards. The Series 35W-RIS shall be furnished with stainless steel 316

back-up rings for installation.

- E. The Diffuser Check Valves shall be a variable orifice providing a non-linear jet velocity vs. flow characteristic, which maximizes jet velocity at low flow rates compared to fixed orifice nozzles, and a linear headloss vs. flow characteristic.
- F. Manufacturer shall have conducted an independent hydraulic test where multiple valves (at least four) of the same size and construction (stiffness) were tested to validate the submitted headloss characteristics and to prove the repeatability of the manufacturing process to produce the same hydraulic characteristics.
- G. Manufacturer shall have conducted independent hydraulic testing to study the flow distribution characteristics of duckbill valves installed on multiport manifolds.
- H. Manufacturer to have conducted Finite Element Analysis (FEA) on various duckbill valves to determine deflection, stress, and strain characteristics under various load conditions. Modeling must have been done for flowing conditions (positive differential pressure) and reverse differential pressure.
- I. The inlet ports/nozzles shall discharge an elliptically shaped jet. The nozzle must have been modeled by an independent laboratory using Laser Induced Fluorescence (LIF).
- J. Manufacturer must have conducted in-house backpressure testing on twelve (12) inch duckbill valves).
- K. Company name, plant location, valve size and serial number shall be bonded to outside of the check valve. Valves shall be manufactured in the USA.

2.2 FUNCTION

- A. When line pressure inside the valve exceeds the backpressure outside the valve, the differential pressure forces the bill of the valve open, allowing flow to discharge. This restriction causes an increase in the jet velocity of the discharge, while the shape of the opening creates a flattened elliptically-shaped jet to increase dispersion. When backpressure exceeds the line pressure, the bill of the valve is forced closed preventing backflow.

2.3 MANUFACTURER

- A. All valves shall be twelve (12) inch Series 35W-RIS, HYDRAULIC CODE NUMBER 2584 as manufactured by the Red Valve Co., Inc. of Carnegie,

PA 15106.

- B. The pre-approved manufacturer of these duckbill nozzles is Tideflex Technologies / Red Valve Company, 600 N. Bell Ave., Carnegie, PA 15106 (412)-279-0044. Alternate manufacturer's must be pre-approved by the ENGINEER, the CONTRACTOR shall submit to the ENGINEER at least twenty (20) days prior to the bid date a reference submittal package as defined within the section entitled Submittals (Section 1.2) showing that the alternate manufacturer can comply with the scope, performance and general intentions of this Specification.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Valve shall be installed in accordance with manufacturer's written Installation and Operation Manual and approved submittals.

3.2 MANUFACTURER'S CUSTOMER SERVICE

- A. Manufacturer's authorized representative shall be available for customer service during installation and start-up, and to train personnel in the operation, maintenance and troubleshooting of the valve.
- B. Manufacturer shall also make customer service available directly from the factory in addition to authorized representatives for assistance during installation and start-up, and to train personnel in the operation, maintenance and troubleshooting of the valve.

3.3 ACCEPTANCE

- A. Acceptance by the OWNER for the diffuser and fittings will be based on a Certificate of Compliance.
- B. Acceptance of the diffuser by the OWNER will be based on Measured or Tested Conformance for mixing zone requirements.

END OF SECTION

DIVISION 12
FURNISHINGS

DIVISION 13
SPECIAL CONSTRUCTION

DIVISION 14
CONVEYING SYSTEMS

DIVISION 15
MECHANICAL

PART 1 – GENERAL

- 1.1 DESCRIPTION: The work in this section consists of providing High Density Polyethylene (HDPE) pipe and fittings.
- 1.2 RELATED WORK SPECIFIED ELSEWHERE: Earthwork and Trenching – Section 02300.
- 1.3 QUALITY ASSURANCE: References, American National Standards Institute (ANSI), American Society for Testing and Materials (ASTM), Federal Specifications (FS), International Standards Organization (ISO), and manufacturer's printed recommendations.
- 1.4 SUBMITTALS: Material list naming each product to be used identified by manufacturer and type number, in accordance with Section 01340.
- 1.5 PRODUCT HANDLING: Handle pipe and fittings to insure delivery in a sound undamaged condition.
- 1.6 JOB CONDITIONS: Do not lay pipe when trenches or weather conditions are not suitable for such work.

PART 2 – MATERIALS

2.1 PIPE:

- A. Pipe shall be manufactured from a resin which meets ASTM D 3350 with a minimum cell classification of 445574C. Pipe shall be manufactured to the dimensions of ASTM F 714. Pipe shall be have a minimum pressure ratings of:

DR 21 101 psi

The pipe shall contain no recycled compounds except that generated in the manufacturer's own plant from resin of the same specification from the same raw material. All HDPE pipe diameters on the drawings shall be "minimum finished outside diameter" and shall have a dimension ratio of 21.

2.2 FITTINGS:

- A. Butt Fusion Fittings - Fittings shall be made from HDPE pipe resin meeting ASTM D 3350 with a minimum cell classification of 445574C.

Molded butt fusion fittings shall have a manufacturing standard of ASTM D 3261. Fabricated fittings must have the same pressure rating as the pipe; a DR less than the pipe shall be used. Fabricated fittings are to be manufactured using a Data Logger to record temperature, fusion pressure, and a graphic representation of the fusion cycle shall be part of the Quality Control records.

- B. Electrofusion Fittings - Fittings shall be made from resin or pipe meeting ASTM D 3350 with a minimum cell classification of 445574C. Electrofusion Fittings shall meet the manufacturing standard of ASTM F 1055. Fittings shall have the same pressure rating as the pipe or higher unless otherwise specified on the plans.
- C. Flanged and Mechanical Joint Adapters - Flanged and Mechanical Joint Adapters shall be made from materials containing resin that meets ASTM D 3350 with a minimum cell classification of 445574C.

PART 3 – EXECUTION

3.1 GENERAL:

- A. Pipe and Fittings: Size as indicated on the plans. Install as shown in accordance with manufacturer's recommendations.

3.2 EARTHWORK AND TRENCHING: Section 02300.

3.3 HAULING, UNLOADING and DISTRIBUTING PIPE: During loading, transportation and unloading, every precaution shall be taken to prevent injury to the pipe. No pipe shall be dropped from cars or trucks, or allowed to roll down slides without proper retaining ropes. During transportation each pipe shall rest on suitable pads, strips, skids or blocks securely wedged or tied in place. Any pipe damaged shall be replaced.

3.4 FUSION:

- A. Sections of polyethylene pipe should be joined into continuous lengths on the jobsite above ground. The joining method shall be the butt fusion method and shall be performed in strict accordance with the pipe supplier's recommendations. The butt fusion equipment used in the joining procedures should be capable of meeting all conditions recommended by the pipe supplier. The butt fusion joining will produce a joint with weld strength equal to or greater than the tensile strength of the pipe itself. All field welds shall be made with fusion equipment equipped with a Data Logger. Temperature, fusion pressure and a graphic representation of the fusion cycle shall be part of the Quality Control records.

- B. Mechanical joining will be used where the butt fusion method cannot be used. Mechanical joining will be accomplished by either using a HDPE flange adapter with a ductile iron back-up ring.
 - C. Hot gas fusion, threading, solvents, and epoxies will not be used to join HDPE pipe.
- 3.5 INSPECTION: Inspect the pipe for defects before installation and fusion. Defective, damaged or unsound pipe will be rejected.
- 3.6 TESTING: Pressure testing shall be conducted in accordance with the ASTM F 2164, Field Leak Testing of Polyethylene Pressure Piping Systems Using Hydrostatic Pressure. The HDPE pipe shall be filled with water, raised to test pressure and allowed to stabilize. The test pressure shall be 1.5 times the operating pressure at the lowest point in the system. The pipe shall pass if the final pressure is within 5% of the test pressure for 1 hour. For safety reasons, hydrostatic testing only will be used.

PART 4 – MEASUREMENT AND PAYMENT

- 4.1 HDPE PIPE, FITTINGS AND ACCESSORIES: Payment will be included under the bid item to which the work relates.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Reinforced concrete low-head pressure pipe (RCLHPP) fittings.
- B. Related sections include but are not necessarily limited to:
 - 1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the Contract.
 - 2. Division 1 - General Requirements.
 - 3. Section 02300 – Earthwork and Trenching.
 - 4. CDOT Spec Section 604 - Manholes, Inlets, and Meter Vaults
 - 5. Division 3 - Concrete.

1.2 MEASUREMENT AND PAYMENT

- A. Measurement
 - 1. Measurement of the RCP will be by the linear foot along the center line. All RCP diameters on the drawings shall be “minimum finished interior diameter”.
- B. Payment
 - 1. Payment for the accepted quantities will be made at the Contract unit price shown in the bid schedule and shall be full compensation for work prescribed in this Section and include design, pipe fittings, tees, reducers, excavation, backfill, bedding, compaction, coatings, corrosion monitoring systems, testing, and removal of obstructions.
 - 2. Payment will be made under: Reinforced Concrete Pipe, 48 IN.

1.3 QUALITY ASSURANCE

- A. Reference Standards
 - 1. American Society for Testing and Materials (ASTM)
 - a. C33, Standard Specification for Concrete Aggregates.
 - b. C150, Standard Specification for Portland Cement.
 - c. C309, Standard Specifications for Liquid Membrane-Forming Compounds for Curing Concrete.
 - d. C361, Standard Specification for Reinforced Concrete Low-Head Pressure Pipe.
 - e. C443, Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
 - f. C494, Standard Specification for Chemical Admixtures for Concrete.

g. C497, Standard Test Methods for Concrete Pipe, Manhole Sections, or Tile.

B. Pipe shall be manufactured in a facility with a minimum of five (5) years continuous experience in manufacturing the pipe specified for this project. Pipe fabrication process at the facility shall have current certification by the American Concrete Pressure Pipe Association.

1.4 SUBMITTALS

A. See Section 01340.

B. Shop Drawings

1. Twenty-one (21) days prior to beginning fabrication of the pipe, submit a tabulated layout schedule with reference to stationing and grade line shown on the Drawings. Include on schedule for each portion of the pipeline: diameter of pipe, design pressures and transient loadings, thickness of pipe, and area of steel in reinforcing cage and steel cylinders. Show elevations and horizontal control of all items included on the shop drawings.
2. Furnish full details of reinforcement, concrete, joints, and special requirements for the straight pipe, special fittings, and appurtenances.
3. Submit drawings and schedules showing details of the core, joint rings, reinforcing steel size and spacing, and bonding bars.
4. Concrete mix designs shall be submitted to the ENGINEER for approval twenty-one (21) days prior to the manufacturing of the pipe. The concrete mix designs shall meet the requirements of Section 03300. Concrete shall be Class C with a minimum compressive strength of 4,000 psi.

C. Manufacturer's installation instructions.

D. All reinforced concrete pipe diameters on the drawings shall be "minimum finished interior diameter."

PART 2 - PRODUCTS

2.1 FABRICATION

A. Reinforced concrete pressure pipe shall conform to ASTM C361 or ASTM C443 and the following additional requirements:

1. Cement shall be Type II conforming to ASTM C150.
2. The minimum Portland cement content shall be 564 pounds per cubic yard.
3. The water/cement ratio shall not exceed 0.45.
4. Elliptical reinforcing is not permitted.

5. The area of the outer circular reinforcing cage shall not be less than 75 percent of the inner cage.
 6. The CONTRACTOR shall provide the ENGINEER with a certificate of compliance from the pipe manufacturer that the pipe and concrete mix conform in all respects to these specifications and other requirements of the referenced ASTM specifications.
- B. Joints shall be rubber gasket type with captive gasket in groove conforming to ASTM C361. Elbows for pipe shall be shop fabricated of the same material, joint design, and strength rating as the pipe.

2.2 CONCRETE AND REINFORCING STEEL

- A. Concrete for fittings, collars, and manholes shall be 2,500 psi concrete. The concrete shall conform to Class B Concrete in accordance with Section 03300. Reinforcing steel shall conform to Section 03200.

2.3 BEDDING FOR PIPE BASE

- A. Gravel for pipe base shall be clean pea gravel or crushed rock with a maximum size of 3/4 in, uniformly graded from coarse to fine and shall conform to CDOT Class C Pipe Bedding.

2.4 SOURCE QUALITY CONTROL

- A. Provide each pipe, fittings, special appurtenance with a clear, permanent, waterproof, marked identification. Include but not necessarily limit markings to the following:
1. Size and class of pipe, pressure rating in compliance with referenced standards.
 2. Date of manufacturer.
 3. Manufacturer's trademark or name.
 4. On bends, the angle of deflection.
 5. On beveled pipe, degree of bevel and point of maximum bevel, marked on the bevel end.
 6. Special notations and tagging of special items in regard to line location.
 7. Identify each pipe and fitting by number corresponding to position along the pipeline on the spigot end of the pipe at a minimum of two visible locations.
- B. Hydrostatic test pipe to a head of twenty-five (25) feet in accordance with ASTM C497.
- C. Conduct testing to evaluate physical properties of pipe components in accordance with requirements of ASTM C361 and C497.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General

1. Install products in accordance with manufacturer's instructions and AWWA M9.
2. Follow all recommendations in accordance with AWWA M9 for installation, delivery and storage of pipe materials.
3. Departure from and return to grade or alignment shall not vary from approved layout drawings by more than 1/16 IN per FT, nor more than 1 IN in total departure, for any point on the pipeline.
4. The use of a pipe-tugger or other methods approved by the ENGINEER will be required to engage each joint.
5. Survey control shall be noted on each pipe joint for verification by the ENGINEER.

B. Bell Holes: Excavate bell holes at each joint to permit proper assembly and inspection of the entire joint.

C. Interior Joint

1. After the joint is engaged, the interior joint recess of pipe shall be cleaned, pre-wetted, and filled with mortar and finished smooth by hand trowel and cured with a curing compound.

D. The trench bottom shall form a continuous and uniform bearing and support for the pipe between joints. Sufficient restraint shall be applied to the line to assure that joints, once home, are held so by tamping backfill material under and alongside the pipe.

3.2 Keep the inside of the pipe clean at all times. When pipe laying is not in progress, close ends of the pipe with a watertight plug or other approved means. At the close of the day's work, or whenever the workmen are absent from the job, the end of the last laid section of the pipe shall be plugged, capped, or otherwise tightly closed to prevent the entry of foreign material. Take all necessary precautions to prevent the uplift of the pipe prior to backfilling.

3.3 FINAL CLEANING

A. Prior to final acceptance of the reinforced concrete pipelines, flush out and remove all accumulated construction debris and other materials.

3.4 ACCEPTANCE

A. Acceptance by the Owner for the pipe and fittings will be based on a Certificate of Compliance.

B. Acceptance by the Owner of the pipeline will be based on Measured or Tested Conformance for meeting the hydrostatic pressure test and backfill

density and gradation.

END OF SECTION

PERMIT INFORMATION



DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO CA 95814-2922

June 17, 2016

Regulatory Division (SPK-2016-00171)

City of Grand Junction Department of Public Works
Attn: Mr. Lee Cooper
250 North 5th Street
Grand Junction, Colorado 81501

Dear Mr. Cooper:

We are responding to your request for a Department of the Army permit for the Persigo Wastewater Treatment Plant (WWTP) Outfall Structure project. This project involves activities, including discharges of dredged or fill material, in waters of the United States to replace the current single source effluent discharge point with an across river effluent diffuser, requiring construction of a cofferdam. The project site is located on the right bank of the Colorado River, in and through Persigo Wash, extending to approximately the center of the Colorado River channel, in the SE $\frac{1}{4}$ of Section 36, Township 1 North, Range 2 West, Ute Meridian, near Latitude 39.110513°, Longitude -108.659410°, in the City of Grand Junction, Mesa County, Colorado.

Based on the information you provided, the proposed activity will permanently affect 0.07 acre and temporarily affect 1.19 acre of the Colorado River and adjacent wetlands. These impacts are authorized by Nationwide Permit Number (NWP) 39 Commercial and Institutional Developments. Your work must comply with the general terms and conditions listed on the enclosed NWP information sheets **and the following special conditions:**

- 1. To insure your project complies with the Federal Endangered Species Act, you must implement all of the measures identified in the enclosed Fish and Wildlife Service letter of concurrence (ES/CO: COE-Water Quality, TAILS 06E24100-2016-I-0271) including those ascribed to the Corps therein. Please note, the Service finds the impacts to be insignificant to the federally listed species since the construction is proposed to be completed in winter months. If you are unable to implement any of these measures, you must immediately notify this office and the Fish and Wildlife Office so we may consult as appropriate, prior to initiating the work, in accordance with Federal law.**
- 2. You are responsible for all work authorized herein and ensuring that all contractors and workers are made aware and adhere to the terms and conditions of this permit authorization. You shall ensure that a copy of the permit authorization and associated drawings are available for quick reference at the project site until all construction activities are completed.**

3. Your use of the permitted activity must not interfere with the public's right to free navigation on all navigable waters of the United States.

This verification is valid until March 18, 2017, when the existing NWP's are scheduled to be modified, reissued, or revoked. Furthermore, if you commence or are under contract to commence this activity before the date the NWP is modified, reissued, or revoked, you will have 12 months from the date of the modification, reissuance or revocation to complete the activity under the present terms and conditions. Failure to comply with the general and regional conditions of this NWP, or the project-specific special conditions of this authorization, may result in the suspension or revocation of your authorization.

We would appreciate your feedback on this permit action including your interaction with our staff. At your earliest convenience, please tell us how we are doing by completing the Corps' Regulatory Program national customer service survey found on our website at www.spk.usace.army.mil/Missions/Regulatory.aspx.

Please refer to identification number SPK-2016-00171 in any correspondence concerning this project. If you have any questions, please contact Travis Morse at the Colorado West Regulatory Branch, 400 Rood Avenue, Room 224, Grand Junction, Colorado 81501, by email at w.travis.morse@usace.army.mil, or by telephone at 970-243-1199 x1014.

Sincerely,



Travis Morse
Senior Project Manager
Colorado West Regulatory Branch

Enclosure

1. Compliance Certification

cc: (w/o encl)

Mr. Collin Haggerty, Stantec Consulting LTD, 2000 South Colorado Boulevard, Suite 2-300, Denver, Colorado 80222

Ms. Melanie Jensen, WestWater Engineering, 2516 Foresight Circle #1, Grand Junction, Colorado 81505

Ms. Dana Brosgin, Mesa County Planning and Economic Development, Post Office Box 20000, Grand Junction, CO 81502-5022

Ms. Erin Scott, Colorado Department of Public Health and Environment, Water Quality Control Division, 4300 Cherry Creek Drive South, Denver, Colorado 80246

Ms. Barb Osmundson, U.S. Fish and Wildlife Service, 445 West Gunnison Avenue, Suite 240, Grand Junction, Colorado 81501-5711

Mr. Rob McCaskey, U.S. Coast Guard, 1222 Spruce Street, St. Louis, Missouri 63103-2381

COMPLIANCE CERTIFICATION

Permit File Name: Persigo WWTP Outfall Structure

Action ID: SPK-2016-00171

Nationwide Permit Number: 39

Permittee: City of Grand Junction Department of Public Works
Attn: Mr. Lee Cooper
250 North 5th Street
Grand Junction, Colorado 81501

County: Mesa

Date of Verification: June 17, 2016

Within 30 days after completion of the activity authorized by this permit, sign this certification and return it to the following address:

U.S. Army Corps of Engineers
Sacramento District
Colorado West Regulatory Branch
400 Rood Avenue, Room 134
Grand Junction, Colorado 81501
(970) 243-1199
Fax (970) 241-2358
DLL-CESPK-RD-Compliance@usace.army.mil

Please note that your permitted activity is subject to a compliance inspection by a U.S. Army Corps of Engineers representative. If you fail to comply with the terms and conditions of the permit your authorization may be suspended, modified, or revoked. If you have any questions about this certification, please contact the U.S. Army Corps of Engineers.

I hereby certify that the work authorized by the above-referenced permit, including all the required mitigation, was completed in accordance with the terms and conditions of the permit verification.

Permittee Signature

Date

ADDENDA

APPENDIX C

USGS Colorado River Flows – Daily Average River Flows



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National Water Information System: Web Interface

USGS Water Resources

Data Category: Geographic Area:

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USGS Surface-Water Daily Statistics for the Nation

The statistics generated from this site are based on approved daily-mean data and may not match those published by the USGS in official publications. The user is responsible for assessment and use of statistics from this site. For more details on why the statistics may not match, [click here](#).

USGS 09163500 COLORADO RIVER NEAR COLORADO-UTAH STATE LINE

Available data for this site

Mesa County, Colorado Hydrologic Unit Code 14010005 Latitude 39°07'58", Longitude 109°01'35" NAD27 Drainage area 17,849 square miles Gage datum 4,325 feet above NGVD29	Output formats <input type="button" value="HTML table of all data"/> <input type="button" value="Tab-separated data"/> <input type="button" value="Reselect output format"/>
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00060, Discharge, cubic feet per second,											
Day of month	Mean of daily mean values for each day for 8 - 9 years of record in, ft3/s (Calculation Period 2007-10-01 -> 2017-01-01)										
	Period-of-record for statistical calculation restricted by user										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
1	2,820	2,920	3,000	3,520	6,340	18,200	12,200	4,820	4,040	4,230	4,230
2	2,740	2,790	2,990	3,650	6,370	18,500	11,800	4,800	3,990	4,280	4,080
3	2,710	2,730	3,030	3,740	6,350	19,100	11,200	4,810	3,900	4,160	3,860
4	2,740	2,720	3,010	3,870	6,240	19,800	10,900	4,850	3,860	4,080	3,850
5	2,810	2,750	3,040	3,770	6,530	20,400	10,400	4,950	3,790	4,140	3,720
6	2,890	2,810	3,000	3,610	7,300	22,000	10,000	4,810	3,780	4,240	3,700
7	2,910	2,840	3,010	3,570	8,990	23,300	9,890	4,680	3,800	4,300	3,630
8	2,950	2,860	3,100	3,540	10,100	23,600	9,570	4,520	3,840	4,300	3,600
9	2,980	2,820	3,120	3,690	10,700	23,200	9,520	4,370	4,010	4,240	3,550
10	2,920	2,840	3,060	3,990	11,100	22,300	9,530	4,190	4,410	4,280	3,540
11	2,880	2,880	3,030	4,250	11,100	21,900	9,200	4,020	4,270	4,340	3,530
12	2,820	2,870	3,080	4,460	11,300	21,300	8,890	3,900	4,240	4,240	3,470
13	2,780	2,870	3,110	4,680	11,200	20,800	8,600	3,780	4,190	4,160	3,380
14	2,810	2,910	3,180	4,790	11,300	19,800	8,260	3,780	4,230	4,160	3,370
15	2,870	2,920	3,190	4,680	11,700	19,000	7,850	3,800	4,330	4,200	3,360
16	2,940	2,930	3,240	4,770	12,600	18,000	7,540	3,770	4,280	4,120	3,370
17	2,970	2,960	3,270	4,990	13,500	17,500	7,210	3,750	4,280	4,040	3,360
18	2,930	2,970	3,380	5,050	14,000	17,600	6,910	3,610	4,230	3,980	3,330
19	2,980	2,960	3,430	5,270	14,300	17,200	6,870	3,490	4,130	3,960	3,280
20	2,970	3,040	3,460	5,750	14,500	16,800	6,840	3,520	4,090	4,010	3,280
21	2,960	3,050	3,380	5,970	14,400	16,700	6,530	3,640	4,070	3,990	3,330
22	2,960	2,980	3,340	6,460	14,400	16,200	6,360	3,570	4,080	4,090	3,410
23	2,950	2,900	3,430	6,910	14,800	15,700	6,140	3,610	4,530	4,230	3,420
24	2,930	2,940	3,470	6,910	15,200	15,500	5,740	3,750	4,460	4,220	3,350
25	2,950	2,930	3,500	6,910	16,300	15,200	5,350	3,800	4,320	4,240	3,320
26	2,920	2,930	3,450	7,070	16,400	15,000	5,200	3,830	4,210	4,380	3,200
27	2,890	2,950	3,390	7,120	15,900	14,600	5,150	3,870	4,150	4,410	3,160
28	2,870	2,970	3,350	6,700	16,200	14,000	4,990	3,990	4,190	4,320	3,230
29	2,850	3,310	3,390	6,330	16,800	13,200	4,960	4,040	4,280	4,280	3,260
30	2,800		3,450	6,220	17,800	12,500	5,060	4,000	4,180	4,290	3,280
31	2,890		3,460		18,400		4,880	3,980		4,260	

APPENDIX D

Persigo WWTP Historical Effluent Flows (September – November)

Persigo Effluent Flows (MGD)

2014	September	October	November
30 Day Average	9.07	8.66	7.91
30 Day Maximum	10.51	9.80	8.78

2015	September	October	November
30 Day Average	9.04	8.91	8.43
30 Day Maximum	9.60	10.07	9.73

2016	September	October	November
30 Day Average	9.49	9.33	7.91
30 Day Maximum	10.10	10.09	8.78