TECHNICAL SPECIFICATIONS
ROMER RANCH POND DAM
REHABILITATION DESIGN

ISSUED FOR CONSTRUCTION

Prepared for:
Fire Adapted Bailey
P.O. Box 465
Pine, CO 80470-0465

Water Division 1, Water District 80
DAMID: 800146

October 2025

W. W. WHEELER
& ASSOCIATES, INC.
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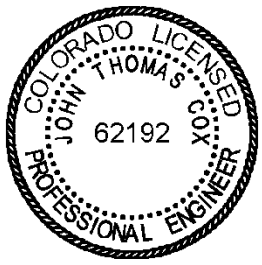
ROMER RANCH POND DAM
REHABILITATION DESIGN

WATER DIVISION NO. 1, DISTRICT NO. 80
PARK COUNTY, COLORADO
COLORADO DAMID: 800146

SPECIFICATION CERTIFICATION

I hereby certify that these Specifications for construction of the Romer Ranch Pond Dam Rehabilitation Design were prepared under my direct supervision for Fire Adapted Bailey.



John T. Cox, P.E.
Registered Professional Engineer Colorado No. 62192

These Specifications and associated Drawings shall not be materially changed without the prior written approval of the Engineer, and also that the works cannot be considered as having been completed until the Engineer has approved the same in writing.

100% FOR CONSTRUCTION BID SCHEDULE
ROMER RANCH REHABILITATION DESIGN
PARK COUNTY, COLORADO

Item No.	Description	Quantity	Unit	Unit Price	Total
1	Mobilization, Bonds, Insurance, and General Conditions	1	LS		
2	Storm Water Management - Erosion and Sediment Control	1	LS		
3	Dewatering, Temporary Diversion, Cofferdams, and Reservoir Management	1	LS		
4	Strip and Stockpile Topsoil and Incidental Grubbing	240	CY		
5	Demolition and Site Preparation	1	LS		
6	Embankment Excavation	793	CY		
7	Borrow and Place Embankment Fill	737	CY		
8	Furnish and Place Filter Sand	5	CY		
9	Furnish and Place Aggregate Base Course	4	CY		
10	Furnish and Place 12-inch D50 Riprap	9	CY		
11	Furnish and Place Riprap Bedding	3	CY		
12	Furnish and Install 12-inch-diameter PVC Outlet Pipe and Pipe Cradle	72	LF		
13	Furnish and Install Outlet Works Precast Concrete Intake Structure, Outlet Works Manhole, and Outlet Structure	1	LS		
14	Furnish and Install Outlet Works Gate, Gate Stem and Operator	1	LS		
15	Furnish and Install Miscellaneous Metalwork & Reservoir Staff Gage	1	LS		
16	Furnish and Install Dry Hydrant	1	LS		
17	Site Reclamation	1	AC		
				Total (Items 1 - 17)	

TABLE OF CONTENTS
TECHNICAL SPECIFICATIONS
ROMER RANCH POND DAM
REHABILITATION DESIGN
PARK COUNTY, COLORADO

SECTION 01010
SCOPE OF WORK

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Description of the Work.
B. Regulatory Requirements.
C. Contractor Use of the Site.
D. Applicable codes, Standards, and Specifications.
E. Manufacturer's Specifications.
F. Substitutions.
G. Means and Methods.
H. Limits of Site Disturbance.

1.2 WORK DESCRIPTION

A. The Work described in these Specifications includes, but is not limited to:

1. Preparatory work, including mobilization and demobilization of all labor, materials, and equipment to the Site that is required to complete the Work. Preparatory Work also includes providing temporary construction facilities and controls; constructing temporary site access roads; mobilizing, maintaining, and demobilizing facilities and equipment; developing designated staging and stockpiling areas; and providing signs, barriers, and safety controls around the Site.
2. Preparatory work includes obtaining permits that must be obtained by the Contractor and obtaining required bonds and insurance for the Project.
3. Preparatory work includes initial dewatering of the reservoir via pumps, siphons, or other means.
4. Installing and maintaining sediment and erosion control features during the Work and removal of these features in accordance with applicable permits when the Work is complete.
5. Performing stripping and stockpiling topsoil and incidental grubbing as specified herein.
6. Installing, maintaining, and removing dewatering and reservoir control systems to control surface water and groundwater during construction.
7. Site demolition as shown on the drawings and as indicated herein, which includes the existing outlet works.
8. Completing all excavations to perform the Work as shown on the Drawings and specified herein.
9. Completing earthwork as shown on the Drawings and specified herein.
10. Furnishing and installing the PVC outlet pipe and Precast Concrete Structures as shown on the Drawings and specified herein.
11. Furnishing and installing the Outlet Works Gate, Gate Stem, and Operator as shown on the Drawings and specified herein.
12. Furnishing and installing Miscellaneous Metalwork and reservoir staff gage as shown on the Drawings and Specified herein.

13. Furnishing and installing the Dry Hydrant as shown on the Drawings and Specified herein.
14. Performing site reseeding and reclamation.
15. All overhead associated with the Project.

1.3 REGULATORY REQUIREMENTS

A. The Approved Construction Drawings and Specifications cannot be significantly changed without prior written approval of the Engineer. Changes may also require approval by the Owner or other approval agency.

B. The Work shall not be considered to be complete until the Engineer and the Owner have accepted the construction in writing.

C. The Engineer, W. W. Wheeler and Associates, Inc., is required to provide on-Site monitoring of the quality of construction as specified in Rule 8.2.1 of the Colorado Rules and Regulations for Dam Safety and Dam Construction, dated January 1, 2020.

1.4 CONTRACTOR USE OF SITE

A. Site Access: The Work Site and designated staging and stockpile areas can be accessed from Romer Ranch Road as shown on the Drawings.

B. The Contractor shall not enter lands adjacent to the construction Site or use other Site access roads to the Work areas unless the specific use of the area is provided in writing by the landowner and approved by the Owner.

C. The Contractor shall limit operations to the areas within the Limits of Site Disturbance shown on the Drawings. Other areas are restricted from use by the Contractor unless specifically authorized in writing by the Owner.

1.5 APPLICABLE CODES, STANDARDS, AND SPECIFICATIONS

A. Unless stated otherwise, the Contractor shall comply with the codes and standards applicable to each type of work and as listed in individual Specification sections. Conflicts shall be resolved as follows:

1. Where a conflict occurs between different reference documents or Agreement documents, the document containing the more stringent requirements governs.
2. Where referenced documents are not specified by date, the latest published, applicable version as of the date of the Bid Due Date shall govern, unless stated otherwise.
3. Where a conflict occurs between the Drawings and the Technical Specifications, the Technical Specifications shall govern.

1.6 MANUFACTURER'S SPECIFICATIONS

A. Materials, applications, and tests specified by reference to published standards of a society, association, code, or other published standards are included in these specifications as if written in their entirety.

B. Products and processes included in the Specifications shall conform to the manufacturer's latest published specifications.

C. The Contractor shall provide sworn affidavits from manufacturers certifying that materials, products, and/or processes delivered and used on the Project meet the

specified requirements. Affidavits shall not relieve the Contractor from the responsibility for full compliance with the requirements of the Specifications.

1.7 SUBSTITUTIONS

A. The Contractor shall provide all equipment, materials, and services as specified or noted on the Drawings, Specifications, and accepted submittals unless a written approval for substitution is obtained from the Engineer. The Engineer's decision regarding the acceptability of substitutions shall be final.

1.8 MEANS AND METHODS

A. Means and methods of construction shall be at the Contractor's sole discretion; subject to the Engineer's right to reject proposed means and methods which:

1. Constitute a hazard to the Work, persons, or property;
2. Constitute an unacceptable dam safety risk, in the opinion of the Engineer, Owner, or State Engineer.
3. Will not produce finished Work in accordance with the terms of the Agreement;
4. Are contrary to specified means and methods required in the Agreement;
5. Violates permit requirements or other Owner agreements or safety documents.

B. The right to reject means and methods of the Contractor shall not be construed or interpreted as acceptance of control of means and methods by the Engineer or the Owner.

C. The Engineer's approval or failure to exercise the right to reject means and methods shall not relieve the Contractor of the obligation to complete the Work required by the Agreement.

D. The Contractor shall be responsible for control of all means and methods for all Work.

1.9 LIMITS OF SITE DISTURBANCE

A. The Contractor shall use care to ensure that no Work is performed outside of the Limits of Site disturbance shown on the Approved Construction Drawings. The Engineer will determine the final location of the limits of Site disturbance in the field and has the right to require the Contractor to place fencing or stakes in critical Work areas to delineate the limits of Site disturbance.

PART 2 - PRODUCTS

(Not used)

PART 3 - EXECUTION

(Not used)

- END OF SECTION 01200 -

SECTION 01025
MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Authority
B. Quantities Specified
C. Measurement of Quantities
D. Payment
E. Defect Assessment
F. Non-payment for rejected products
G. Measurement and Payment of bid items

1.2 AUTHORITY

A. Measurement methods delineated in the Specification sections are intended to complement the criteria of this section. In the event of conflict, the requirements of this Specification section shall govern.
B. The Contractor is responsible for making all measurements and computing quantities for payment. The Engineer will verify measurements and quantities.
C. The Contractor shall provide necessary equipment, labor, and survey personnel as required to measure and compute quantities.

1.3 QUANTITIES SPECIFIED

A. Quantities and measurements indicated in the Bid Schedule are for bidding and contract management purposes only. Only quantities and measurements supplied or placed to the Neat Lines shown on the drawings, verified, and approved by the Engineer shall determine payment.
B. If the actual Work requires greater or fewer quantities than those quantities indicated, provide or omit the required quantities at the unit sum/prices contracted.
C. There shall be no adjustment in unit prices if the actual quantity required is within 25 percent of the quantity shown in the Bid Schedule.
D. The Owner reserves the right to delete any item of Work in the Bid Schedules that is not required. If a Work item is deleted, the Contractor shall not be entitled to any payment for that bid item.

1.4 MEASUREMENT OF QUANTITIES

A. Measurement Devices:
    1. Weigh scales: inspected, tested, and certified within the past year.
    2. Platform scales: of sufficient size and capacity to accommodate the conveying vehicle.
    3. Metering devices: inspected, tested, and certified within the past year.
B. Measurement by volume: Measured by cubic dimension using mean length, width, and height or thickness.
C. Measurement by area: Measured by square dimension using mean length and width or radius.
D. Linear measurement: Measured by linear dimension, at the item centerline or mean chord.

1.5 PAYMENT

A. Payment includes: Full compensation for all required labor, supervision, products, tools, equipment, plant, transportation, services and incidentals, handling, stockpiling, rehandling, erection, application or installation of an item of the Work, including overhead and profit.

B. Final payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities approved by the Engineer multiplied by the unit price for Work. There will be no payment for unauthorized Work that is not approved by the Engineer.

1.6 DEFECT ASSESSMENT

A. The Contractor shall replace the Work, or portions of the Work, not conforming to specified requirements as determined by the Engineer at Contractor's sole cost.

B. If, in the opinion of the Engineer, it is not practical to remove and replace the Work, the Engineer will direct one of the following remedies:

1. The defective Work may remain, but the unit price will be adjusted to a new unit sum/price at the discretion of the Owner.
2. The defective Work shall be partially repaired to the satisfaction of the Engineer and the Owner, and the unit price will be adjusted to a new unit sum/price at the discretion of the Engineer.

C. The authority of the Owner to assess the defect and identify payment adjustment is final.

1.7 NON-PAYMENT FOR REJECTED PRODUCTS

A. Payment will not be made for any of the following:

1. Products wasted or disposed of in a manner that is not acceptable to the Engineer or the Owner.
2. Products determined as unacceptable before or after placement.
3. Products not completely unloaded from the transporting vehicle.
4. Products placed beyond the neat line limits of excavation or the limits of Site disturbance of the required Work.
5. Products remaining on hand after completion of the Work.
6. Loading, hauling, and disposing of rejected Products.

1.8 MEASUREMENT AND PAYMENT OF BID ITEMS

A. Refer to Specification Section 01010: Summary of Work, for Work scope.

B. Measurement and payment provisions for Romer Ranch Pond Dam base bid construction items documented in the Bid Schedule shall be as follows:

1. Mobilization, Bonds, Insurance, and General Conditions
   a. Mobilization, Bonds, Insurance, and General Conditions will not be measured for payment.
   b. Payment for Mobilization, Bonds, Insurance, and General Conditions will be made at the lump sum price bid in the Bid Schedule. The price shall include, but is not limited to all costs for temporary access roads; temporary construction of or excavation for staging and stockpiling areas; temporary utilities, construction water management, and other construction facilities and controls; survey costs; cleanup and

disposal of waste materials; movement of personnel, equipment, supplies, trailers, plants, and other facilities to and out of the Project Site; any necessary costs of acquisition of equipment, including purchase, rental, and mobilization expense; bonds and insurance.

c. Progress payments for Mobilization, Bonds, Insurance, and General Conditions shall be made as follows:

(i) After the Contractor has mobilized materials, equipment, and construction facilities to the Site, fifty percent (50%) of the bid price for Item No. 1 will be paid.

(ii) When ten percent (10%) of the original contracted amount is earned from other items in the Bid Schedule, ninety percent (90%) of the bid price for Item No. 1 will be paid.

(iii) When the Contractor and all Subcontractors have demobilized from the Site and completed the Work, as described in Specification Section 01010: Summary of Work, to the satisfaction of the Engineer and Owner, the remaining balance of the bid price for Item No. 1 will be paid.

2. Storm Water Management – Erosion and Sediment Control

a. Storm Water Management – Erosion and Sediment Control will not be measured for payment.

b. Payment to the Contractor for Storm Water Management – Erosion and Sediment Control shall be made at the lump sum price in the Bid Schedule. The price shall include all costs for constructing, maintaining, and removing temporary sediment and erosion control facilities, temporary drainage facilities, and other temporary protection facilities. The price for this bid item shall also include all costs to obtain a construction stormwater permit, and all costs to maintain the stormwater management plan associated with this permit.

3. Dewatering, Temporary Diversion, Cofferdams, and Reservoir Management

a. Dewatering, Temporary Diversion, Cofferdams, and Reservoir Management will not be measured for payment.

b. Payment to the Contractor for Dewatering, Temporary Diversion, Cofferdams, and Reservoir Management will be made at the lump sum price in the Bid Schedule. The price shall include all costs for providing materials and labor to install and maintain all dewatering, including pumps, piping, sump pits and backfill, and other facilities for the control, collection, and disposal of groundwater for the proper construction of all contract work; maintaining foundations and other parts of the work free from water as required; complying with all applicable environmental protection laws and requirements for operation of the dewatering system; and removing all components of the dewatering system after dewatering is complete. The price for this bid item shall also include all costs to obtain a Colorado Department of Health and Environment (CDPHE) construction dewatering permit,

and all costs to maintain the construction dewatering permit. The price shall also include all costs for materials and labor to construct the Contractor's approved reservoir control system, and for initial dewatering of the reservoir.

4. Strip and Stockpile Topsoil and Incidental Grubbing.
   a. Strip and Stockpile Topsoil and Incidental Grubbing shall be measured for payment in cubic yards of topsoil stripped and stockpiled and approved by the Engineer. Topsoil will be measured in the stockpile.
   b. Payment for Strip and Stockpile Topsoil and Incidental Grubbing shall be paid for at the unit price per cubic yard bid in the Bid Schedule. The price for this bid item shall include all costs for stripping, hauling, and disposing of excess topsoil not used for construction. The cost for this item shall also include costs for incidental clearing or grubbing related to stripping of topsoil, including localized clearing or grubbing, removing surface debris, and disposing of cleared or grubbed materials.
5. Demolition and Site Preparation
   a. Demolition and Site Preparation shall not be measured for payment.
   b. Payment for demolition and site preparation will be made at the lump sum price bid in the Bid Schedule. The price shall include all labor, materials, and equipment to demolish and dispose of items identified for demolition on the Drawings and in Specification Section 02075: Demolition, and includes but is not limited to the existing low-level outlet, gate operator, and gate pedestal.
6. Embankment Excavation
   a. Embankment Excavation will be measured for payment in cubic yards of soil excavated in place within the Neat Line limits of excavation as shown on the Drawings and approved by the Engineer.
   b. Payment for Embankment Excavation will be made at the unit price per cubic yard in the Bid Schedule. The price shall include all costs for equipment, materials, and labor necessary for excavation in the embankment as shown on the Drawings and approved by the Engineer, and disposal of excess excavated materials not used for construction.
7. Borrow and Place Embankment Fill
   a. Borrow and Place Embankment Fill shall be measured for payment in cubic yards in-place to the Neat Line shown on the Drawings and approved by the Engineer.
   b. Payment for Borrow and Place Embankment Fill will be made at the unit price per cubic yard bid in the Bid Schedule. The price shall include all costs for borrowing, hauling, stockpiling, moisture conditioning, compacting, and reworking embankment fill.

8. Furnish and Place Filter Sand
    a. Furnish and Place Filter Sand shall be measured for payment in cubic yards of material in-place to the Neat Line shown on the Drawings and approved by the Engineer.
    b. Payment for Furnish and Place Filter Sand shall be made at the unit price per cubic yard bid in the Bid Schedule. The price shall include all costs for furnishing the filter sand, hauling, stockpiling, and placing the filter sand.
9. Furnish and Place Aggregate Base Course
    a. Furnish and Place Aggregate Base Course shall be measured for payment in cubic yards of material in-place to the Neat Line shown on the Drawings and approved by the Engineer.
    b. Payment for Furnish and Place Aggregate Base Course shall be made at the unit price per cubic yard bid in the Bid Schedule. The price shall include all costs for furnishing the Aggregate Base Course, hauling, stockpiling, and placing the Aggregate Base Course.
10. Furnish and Place 12-inch D_{50} Riprap
    a. Furnish and Place 12-inch D_{50} Riprap shall be measured for payment in cubic yards of material in-place to the Neat Line shown on the Drawings and approved by the Engineer.
    b. Payment for Furnish and Place 12-inch D_{50} Riprap shall be made at the unit price per cubic yard bid in the Bid Schedule. The price shall include all costs for furnishing the riprap, hauling, stockpiling, and placing the riprap.
11. Furnish and Place Riprap Bedding
    a. Furnish and Place Riprap Bedding shall be measured for payment in cubic yards of material in-place to the Neat Line shown on the Drawings and approved by the Engineer.
    b. Payment for Furnish and Place Riprap Bedding shall be made at the unit price per cubic yard bid in the Bid Schedule. The price shall include all costs for furnishing the riprap bedding, hauling, stockpiling, and placing the riprap bedding.
12. Furnish and Install 12-inch-diameter C900 PVC Outlet Pipe and Pipe Cradle
    a. Furnish and Install 12-inch-diameter C900 PVC Outlet Pipe and Pipe Cradle shall be measured for payment in linear feet of C900 PVC Outlet Pipe and Pipe Cradle installed and approved by the Engineer.
    b. Payment for Furnish and Install 12-inch-diameter C900 PVC Outlet Pipe and Pipe Cradle shall be made at the unit price per linear foot bid in the Bid Schedule. The price shall include all labor and material costs required for furnishing, hauling, stockpiling, and installing the PVC Outlet Pipe and Pipe Cradle. The price shall also include trench excavation and backfill, and items required to secure the pipe from flotation during cradle placement.

13. Furnish and Install Outlet Works Precast Concrete Intake Structure, Outlet Works Manhole, and Outlet Structure
    a. Furnish and Install Outlet Works Precast Concrete Intake Structure, Outlet Works Manhole, and Outlet Structure shall not be measured for payment.
    b. Payment for Furnish and Install Outlet Works Precast Concrete Intake Structure, Outlet Works Manhole, and Outlet Structure shall be made at the lump sum price bid in the Bid Schedule. The price shall include all labor and material costs required for furnishing, hauling, stockpiling, and installing the Outlet Works Precast Concrete Intake Structure, Outlet Works Manhole, and Outlet Structure.
14. Furnish and Install Outlet Works Gate, Gate Stem, and Operator
    a. Furnish and install Outlet Works Gate, Gate Stem, and Operator shall not be measured for payment.
    b. Payment for Furnish and Install Outlet Works Gate, Gate Stem, and Operator shall be at the lump sum price in the Bid Schedule. The price shall include installing the gate, stem, and operator, as well as testing and commissioning of the gates. Mastic, grout, gaskets, anchors, epoxy capsules for anchors, and other materials required for gate installation will be provided by the Contractor and are included in the bid price.
15. Furnish and Install Miscellaneous Metalwork and Reservoir Staff Gage
    a. Furnish and Install Miscellaneous Metalwork and Reservoir Staff Gage shall not be measured for payment.
    b. Payment for Furnish and Install Miscellaneous Metalwork and Reservoir Staff Gage shall be at the lump sum price in the Bid Schedule. The price shall include all costs to furnish, fabricate, finish, transport, and install the metalwork. Miscellaneous metalwork items are shown on the Drawings and described in Specification Section 05120: Miscellaneous Metalwork. These items include but are not limited to the intake structure trashrack, the manhole access hatch, and manhole steps. The price shall also include all costs to furnish and install the reservoir staff gage.
16. Furnish and Install Dry Hydrant
    a. Furnish and Install Dry Hydrant shall not be measured for payment.
    b. Payment for Furnish and Install Dry Hydrant shall be at the lump sum price in the Bid Schedule. The price shall include all costs to furnish, fabricate, finish, transport, and install the dry hydrant valve, piping, strainer, strainer support, and thrust block. The price shall also include costs for trench excavations and backfill required for dry hydrant installation.
17. Site Reclamation
    a. Site Reclamation shall be measured in acres reclaimed within the limits of disturbance as shown on the Drawings.

b. Payment for Site Reclamation shall be made at the unit price per acre bid in the Bid Schedule. The price shall include all costs for equipment, materials, and labor required to reclaim staging and stockpile areas, the upstream face of the embankment dam above the normal high water line, the downstream face of the embankment dam, access roads, and other disturbed areas. Reclamation shall include furnishing, hauling, placing, topsoil and seed, and seeding to the neat line shown on the Drawings and approved by the Engineer. It shall also include costs for furnishing, hauling, and placing mulch, erosion control blanket, and fertilizer.

PART 2 - PRODUCTS

(Not used)

PART 3 - EXECUTION

(Not used)

- END OF SECTION 01025 -

SECTION 01050
SURVEY CONTROL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Summary of Survey Work
B. Submittals
C. Survey Reference Points
D. Survey Requirements
E. Surveys for Measurement and Payment
F. Record Surveys
G. Equipment and Materials

1.2 SUMMARY OF SURVEY WORK

A. The Contractor shall provide all materials, labor, equipment, and incidentals required to conduct proper surveys to stake and layout the Work.

B. The Contractor shall use existing Site control points, coordinates, and centerlines as shown on the Approved Construction Drawings to layout the Work. The elevation and locations of the control points shall be verified by the Contractor.

C. The Contractor shall perform surveys to verify completed Work for measurements and payment. The Engineer reserves the right to perform an independent survey for verifying completed Work for measurements and payment of completed Work.

D. Upon completion of the Work, the Contractor shall provide "as-built" surveys to establish Record Drawings of the completed construction and dam safety instrumentation. The "as-built" surveys shall meet the requirements of Paragraph 1.7 of this Specification Section.

E. The Contractor shall have a Professional Land Surveyor (PLS) licensed in the State of Colorado verify control points prior to commencing the Work, but the layout and staking of the Work does not need to be performed by a Colorado PLS. The Record Surveys described in Paragraph 1.7 of this Section of the Specifications must by stamped by a Colorado PLS.

1.3 SUBMITTALS

A. All survey control submittals shall be submitted in accordance with Section 01300: Submittals. The following minimum survey control submittals are required:

1. Surveyor Qualification Submittal: The name and qualifications of the PLS who will be responsible verifying the Contractor's survey control points and responsible for the Record Surveys. The name and qualifications of the people who will perform the Site layout and measurement and payment surveys.
2. Copy of field survey notes of electronic data in accordance with the due date shown in Section 01300: Submittals. Field notes and quantity calculations shall also be submitted with the Contractor's progress payments.
3. Record Survey Submittal that includes, as a minimum, the information documented in Paragraph 1.7 of Section 01050: Survey Control.

1.4 SURVEY REFERENCE POINTS

A. The Contractor shall locate and protect survey control and Control Points prior to starting Site Work and preserve permanent Site Benchmarks during construction. The Contractor shall not relocate Site Benchmarks without prior written approval from Engineer.

B. Controls for survey (vertical and horizontal) shall be based on the control point information provided on the Approved Construction Drawings and the specifications herein:

1. Horizontal project coordinates shall be Colorado State Plane Central, North American Datum 1983 (NAD 83).
2. Project vertical control shall be based on North American Vertical Datum 1988 (NVAD 88).

C. The Contractor shall notify the Engineer within twenty-four (24) hours of the loss or destruction of any Control Point or relocation required because of changes in grades or other reasons.

D. Survey Control Point damaged by the Contractor's operations shall be replaced by a PLS licensed in the State of Colorado at no cost to the Owner.

1.5 SURVEY REQUIREMENTS

A. Establish the dam axis, centerlines, and reference lines for all structures, as shown on the Approved Construction Drawings.

B. Establish elevations, lines, and levels.

C. Periodically verify layouts by same means.

D. All Work done with the methods and equipment that is not acceptable to the Engineer shall be removed and replaced by the Contractor at the Contractor's own expense.

E. Degree of accuracy shall be of an order high enough to satisfy tolerances specified for the Work and the following:

1. Points for cross-sections shall be located to the nearest 0.1 foot horizontally and vertically.
2. Alignment of tangents and curves shall be within 0.1 foot.
3. Points for structures shall be set to the nearest 0.1 foot.

1.6 SURVEYS FOR MEASUREMENT AND PAYMENT

A. The Contractor is responsible for performing surveys to determine quantities of unit cost Work, including control surveys, to establish measurement reference lines.

B. All surveys performed for measurements of quantities of Work and material shall be subject to approval of the Engineer. Unless waived by the Engineer, quantity surveys by the Contractor shall be performed in the presence of the Engineer, or designated representative. The Contractor shall notify the Engineer at least seventy-two (72) hours in advance of the performance of quantity surveys.

C. The Contractor shall conduct such surveys and computations, as necessary, to determine the quantities of Work performed or placed during each period for which a progress payment is to be made. The Contractor shall furnish the Engineer with a copy of the quantity computations and an itemized statement for each progress payment period.

D. The Contractor shall assist the Engineer with any independent surveys conducted to verify the Work or measurements for payment.

1.7 RECORD SURVEYS

A. Prior to completion of the Work, the Contractor shall perform Record Surveys and provide electronic AutoCAD files of the following:

1. A Record Site Topographic Map of the final construction grades and the final one-foot contours.
2. A Record Survey of the "as-built" coordinates (Northing, Easting, and Elevations) of the dam safety instruments shown on the Approved Construction Drawings.
3. A Record Survey of the Work, structure and conduit invert elevations, the dry hydrant, and other items as directed by the Engineer.
4. Elevations and coordinates of new benchmarks and structure control points.
5. PLS stamped hard copy of all deliverables.

PART 2 - PRODUCTS

2.1 EQUIPMENT AND MATERIALS

A. The Contractor shall furnish all equipment and materials including instruments, stakes, spikes, steel pins, templates, platforms, tools, and other accessories as may be required in laying out any part of the Work from the primary control points and in performing quantity, layout, and Record Surveys. Instrumentation shall be accurate and shall be subject to inspection. Any defective instruments, as determined by the Engineer, shall be promptly replaced, repaired, or adjusted as required.

PART 3 - EXECUTION

(Not used)

- END OF SECTION 01050 -

SECTION 01092
ABBREVIATIONS, ACRONYMS, AND DEFINITIONS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. A list of abbreviations and acronyms

B. A list of definitions

1.2 ABBREVIATIONS

A. Abbreviations and acronyms used throughout the Specifications are defined as follows:

AASHTO	American Association of State Highway Transportation Officials
ACI	American Concrete Institute
AGA	American Gas Association
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
ALSC	American Lumber Standards Committee
AMA	American Materials Association
ANSI	American National Standards Institute
APA	American Plywood Association (formerly DFPA)
APHA	American Public Health Association
APPROX.	Approximate
ASA	American Standards Association (now USAS)
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWPI	American Wood Preservers Institute
AWS	American Welding Society
AWPA	American Wood Preserver's Association
AWWA	American Water Works Association
B.O.	Bottom of
BOP	Bottom of Pit
CRSI	Concrete Reinforcing Steel Institute
CS	Commercial Standards of U.S. Department of Standards
CSI	Construction Specifications Institute
DFPA	Douglas Fir Plywood Association (now APA)
DIA.	Diameter
EF	Each Face
EJ	Expansion Joints
EL.	Elevation
EW	Each Way
FML	Factory Mutual Laboratories
FS	Federal Specifications
IBR	Institute of Boiler and Radiator Manufacturers
MBMA	Metal Building Manufacturer's Association

MLA	Metal Lath Association
NAAMM	National Association of Architectural Metal Manufacturers
NICET	National Institute for Certification in Engineering Technology
NBC	National Building Code
NBFU	National Bureau of Fire Underwriters
NBS	National Bureau of Standards
NCMA	National Concrete Masonry Association
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NFPS	National Forest Products Association
NPC	National Plumbing Code
NPDES	National Pollutant Discharge Elimination System
NRMCA	National Ready Mixed Concrete Association
NSF	National Sanitation Foundation
NWMA	National Woodwork Manufacturing Association
OSHA	Occupational Safety and Health Administration, U.S. Department of Labor
PCA	Portland Cement Association
PVC	Polyvinyl Chloride
SBI	Steel Boiler Institute
SCPI	Structural Clay Products Institute
SDI	Steel Deck Institute
SJI	Steel Joist Institute
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SPI	Steel Products Institute
SPR	Simplified Practice Recommendation
SSPC	Steel Structures Painting Council
T.O.	Top of
TOP	Top of Pit
TYP.	Typical
UBC	Uniform Building Code
UL	Underwriters Laboratories
UPC	Uniform Plumbing Code
USAS	United States of America Standards (formerly ASA)
USBR	U.S. Bureau of Reclamation
USCOE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
WPCF	Water Pollution Control Federation
WWPA	Western Wood Products Association

B. Additional abbreviations, if any, will be defined as they appear in the Specifications.

1.3 DEFINITIONS

A. Definitions used throughout the Specifications and Contract Documents include:

1. Approved Construction Drawings or Drawings

a. Shall be the Construction Drawings that are stamped by the Engineer and designated as “Approved for Construction”.

2. Contract Documents
   a. Those items so designated in the Agreement, General Requirements, Special Provisions, Technical Specifications and Drawings.
3. Contractor
   a. Shall mean the “Contractor” as set forth in the Agreement.
4. Engineer
   a. Shall mean the Owner’s Engineer, or its designated subconsultants, or other representatives.
5. Neat Line
   a. Shall mean the dimensions shown on the Approved Construction Drawings of a line from a specified or labeled reference point. No additional payment will be made for Work outside of the Neat Line shown on the Approved Construction Drawings.
6. Manufacturer
   a. Shall mean the entity responsible for fabrication and manufacturing key components of the work such as, but not limited to the outlet works gate manufacturer.
7. Owner
   a. Shall mean the Project Owner, Fire Adapted Bailey.
8. Project
   a. Shall mean the entirety, or a portion of, the Work being provided by Contractor and its Subcontractors under the Agreement.
9. Property Owner
   a. Shall mean the Property Owner, Romer Ranch Company, LLC.
10. Site
    a. Shall mean the Work area within the limits of site disturbance and associated staging and stockpile areas.
11. Specifications
    a. Shall mean these Technical Specifications for the Project that are stamped and approved by the Engineer.
12. State Engineer
    a. Shall mean the Colorado Office of the State Engineer, Division of Water Resources, Dam Safety Branch. The State Engineer may also be abbreviated as (SEO) in some sections of these Specifications.
13. Work
    a. Shall mean all labor, services or activities to be furnished or performed pursuant to the Agreement. This includes, but is not limited to, equipment, machinery, supplies, Goods, (including raw materials, components, intermediate assemblies, and end products), Design(s), technical information, inspection, installation, testing, transportation, expediting and delivery information and services, and related work.

PART 2 - PRODUCTS
(Not used)

PART 3 - EXECUTION
(Not used)

- END OF SECTION 01092 -

SECTION 01100
CONSTRUCTION SEQUENCE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Submittals
B. Work Sequence
C. Work Hours and Notifications
D. A description of the Contractor's normal work hours

1.2 SUBMITTALS

A. The Contractor shall submit a construction schedule in accordance with Section 01300: Submittals. The construction schedule shall clearly illustrate the Contractor's Work breakdown structure, and key schedule dependencies of all required Work tasks and subtasks. The schedule shall clearly illustrate the critical path of the Work and scheduled start dates, finish dates, and float time for all tasks and subtasks. The construction schedule shall be submitted in a legible printed format with color print to enhance its legibility if applicable.

B. The Contractor shall submit an updated three (3) week, look-ahead schedule of scheduled Work tasks as part of the Project meetings described in Section 01200: Project Meetings.

PART 2 - PRODUCTS

(Not used)

PART 3 - EXECUTION

3.1 GENERAL

A. The Contractor shall develop the sequence of Work tasks and document this sequence in the construction schedule as described in Paragraphs 1.2.A and 1.2.B of this Section of the Specifications.

B. The Contractor may request revisions to the construction sequence and normal work hours described in this section of the Specifications, but requested revisions must be approved in writing by the Owner or Engineer prior to initiating such revisions.

3.2 WORK HOURS AND NOTIFICATIONS

A. The Contractor shall establish normal, daylight, Project work hours and work days. The Engineer shall be notified at least twenty-four (24) hours in advance of any changes in normal Project work hours or work days. Work outside of the normal established work hours may require approval by the Owner or other agencies.

B. The Contractor is required to provide written notification to the Engineer at least three (3) calendar days in advance of placement of any concrete.

- END OF SECTION 01100 -

SECTION 01114
CLEANUP AND DISPOSAL OF WASTE MATERIALS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. A description of provisions for cleanup and disposal of waste materials.

1.2 DEFINITIONS

A. Materials to be disposed of shall be classified in four categories:
   1. Excess excavated soil and rock,
   2. Cleared vegetation,
   3. Demolished items,
   4. Waste materials

B. Excess excavated materials shall include excavated soil and all excavated bedrock materials that are not approved for use in construction or are in excess of the material needed for construction, or sediment collected from the erosion control system.

C. Cleared Vegetation shall include vegetation cleared or grubbed from within the limits of site disturbance, from the staging and stockpile areas, or from removed trees.

D. Demolished items include, but are not limited to, demolished concrete rubble and reinforcing steel bars, and other items noted for demolition on the Approved Drawings.

E. Waste materials shall include waste grout, waste concrete, oil and other petroleum products, refuse, garbage, debris, sanitary waste, crank case oil, grease, paint thinner, cleaning solvents, or any other materials used in maintenance or operation of construction equipment.

1.3 DISPOSAL REQUIREMENTS

A. The Contractor shall, at all times, keep the construction area, including storage areas, free from accumulations of waste materials or rubbish.

B. The Contractor shall be responsible for laying out and maintaining concrete wash-out and waste facilities associated with these waste facilities.

C. Before completion of the Work, the Contractor shall remove from the vicinity of the Work all plant facilities, trailers, rubbish, unused materials, and other like materials belonging to the Contractor or used under the Contractor's direction during construction. All Work areas shall be graded and left in a neat manner conforming to the general appearance of the preconstruction landscape.

D. In the event of the Contractor's failure to perform the above Work, the Work may be performed by the Owner at the expense of the Contractor, and the Contractor’s surety or sureties shall therefore be liable.

E. On-site disposal for disposal of excess excavated materials and cleared vegetation shall not be permitted.

F. Burning or burying of cleared vegetation and waste material shall not be permitted.

G. All demolished items and waste materials shall be disposed offsite. Any fees or charges required to be paid for disposal of materials off-site shall be paid by the Contractor and included in the costs of other bid items. No separate payment will be made for disposal of demolished items or waste materials.

PART 2 - PRODUCTS
(Not used)

PART 3 - EXECUTION
(Not used)

- END OF SECTION 01114 -

SECTION 01200
PROJECT MEETINGS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. A description of required Project Meetings.

PART 2 - PRODUCTS

(Not used)

PART 3 - EXECUTION

3.1 PROJECT MEETINGS

A. The Contractor is required to participate in a pre-construction meeting prior to commencement of on-site construction with representatives of the Engineer and the Owner before any Work is initiated on-site. During the pre-construction meeting, the Contractor shall develop and thoroughly explain their construction schedule; safety programs; construction management procedures; proposed construction facilities; and construction layout plan for staging, stockpiling, borrow, waste disposal; and other key construction activities. The name of key Subcontractors and the Contractor's Project Manager, Site Superintendent, and Site Safety Officer shall be confirmed at the meeting. Project communication protocol between the Owner, Engineer, and the State Engineer shall be established at the pre-construction meeting.

B. The Contractor's on-site Superintendent or Project Manager shall meet with the Engineer and Owner representatives at the job Site at least weekly to discuss Work progress. The Engineer may schedule more frequent meetings or teleconferences, as needed. Other project stakeholders may participate in the weekly meetings, either on-site or via teleconferences at the discretion of the Engineer or Owner.

C. During the weekly progress meetings, the Contractor shall provide a verbal report of Project progress during the last week. The Contractor shall also review the latest Work schedule and present all conflicts, discrepancies, and other construction challenges for resolution. Prior to each progress meeting, the Contractor shall provide an updated, three-week, look-ahead schedule and discuss key near-term milestones.

D. The Engineer, or his designated representative, will prepare a written summary of each progress meeting and distribute a summary to key Project stakeholders, the Owner, the Contractor, the State Engineer and other interested parties.

- END OF SECTION 01200 -

SECTION 01300
SUBMITTALS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Definitions
B. Information on Review and Processing Submittals
C. Submittal Sequencing and Scheduling
D. Engineer's and State Engineer Review
E. Schedule Delays
F. Submittal Procedures
G. Product Data, Shop Drawings, and Samples
H. Miscellaneous Submittals
I. List of Submittals

1.2 DEFINITIONS

A. Work-related submittals of this Section are categorized for convenience as follows:
   1. Product Data: Product data include standard printed information on materials, products, and systems not specifically prepared for the Work.
   2. Shop Drawings: Shop Drawings include specially prepared technical data for the Work, including Drawings, diagrams, Fabrication Drawings, data sheets, schedules, templates, patterns, reports, calculations, instructions, measurements, and similar information not in standard printed form for general application to other contracts.
   3. Samples: Samples include both fabricated and unfabricated physical examples of materials, products, and units of Work; both as complete units and as smaller portions of units of Work, either for limited visual inspection or, where indicated, for more detailed testing and analysis.
   4. Miscellaneous Submittals: Miscellaneous Submittals related directly to the Work include, but are not limited to, construction permits, Project photographs, survey data and reports, physical Work records, quality testing and certifying reports, copies of industry standards, Record Drawings, field measurement data; and similar information, devices and materials applicable to the Work and not processed as Product Data, Shop Drawings, or Samples.
   5. Days: Days referenced herein shall be calendar days.

1.3 REVIEW AND PROCESSING OF SUBMITTALS

A. A summary of required submittals, but not necessarily all required submittals is listed in Table No. 1 at the end of this section. The Contractor is required to make all submittals required by the Agreement documents, including these Specifications. Detailed submittal requirements are included in each section of these Specifications.
B. The Engineer will review submittals only for general conformance with the design concept. Such review by the Engineer shall not relieve the Contractor or any Subcontractor of responsibility for full compliance with Agreement requirements; for correctness of dimensions, clearances and material quantities; for proper designing of details; for proper fabrication and construction techniques; for proper coordination

with other trades; or for providing all devices required for safe and satisfactory construction and operation.

C. Submittals reviewed by the Engineer and returned to the Contractor shall be marked with one of the following designations:
   1. No Exceptions Taken
   2. Make Corrections Noted
   3. Revise and Resubmit

D. The Contractor shall not proceed with procurement, manufacture, or fabrication of items for review until such submittals have been designated by the Engineer as "No Exceptions Taken" or "Make Corrections Noted," unless specifically authorized in writing to do so by the Engineer.

E. Processing of submittals that do not require resubmission:
   1. An electronic copy of the submittal so designated by the Engineer will be identified accordingly by being so stamped and dated, and returned to the Contractor.
   2. Construction shall be carried out in accordance therewith and no further changes made therein except upon written instructions from the Engineer.

F. Processing of Submittals requiring resubmission:
   1. If corrections to the submittals are required, an electronic copy will be returned to the Contractor for correction.
   2. Resubmissions will be handled in the same manner as first submissions. Direct specific attention, in writing or on resubmittals, to revisions other than the corrections requested by the Engineer on previous submittals using the notation specified in Paragraph 3.1.B.
   3. The Contractor shall promptly notify the Engineer, if any correction indicated on submittals constitutes a change of the Agreement requirements.

1.4 SUBMITTAL SEQUENCING AND SCHEDULING

A. Coordinate preparation and processing of submittals with performance of the Work so that Work will not be delayed by submittals.

B. Coordinate and sequence different categories of submittals for the same Work, and for interfacing units of Work, so that one will not be delayed for coordination with another.

C. The Contractor shall make all submittals far enough in advance of scheduled installation dates to provide all time required for reviews, for possible revisions and resubmittals, and for placing orders and securing delivery.

1.5 ENGINEER'S AND STATE ENGINEER REVIEW

A. The Engineer will review and prepare a response to the Contractor no later than fourteen (14) calendar days after receipt of the submittal. Resubmissions shall be subject to the same review time.

B. Key submittals may require approval by the State Engineer at their discretion. These submittals may require more than fourteen (14) days to obtain a response. The submittals that require State Engineer approval will be identified during the pre-construction meeting.

1.6 SCHEDULE DELAYS

A. No adjustments of Agreement time or price shall be allowed due to the following:
   1. Engineer's review of submittals or resubmissions.
   2. Delays in Work as a result of rejection and subsequent resubmission of Submittals, including multiple resubmissions.
   3. Time related to the State Engineer review of submittals.

PART 2 - PRODUCTS

(Not used)

PART 3 - EXECUTION

3.1 SUBMITTAL PROCEDURES

A. All submittals shall be transmitted electronically.

B. All submittals shall be transmitted with the pre-printed letter of transmittal form, dated and signed, with the job title and section(s) of the Specification requiring the submittal clearly indicated. The forms shall be sequentially numbered. Resubmittals shall have the original number together with an alphabetic suffix (A, B ...) indicating the number of resubmittals. The transmittal form is provided at the end of this section of the specifications.

C. By providing the submittal, the Contractor shall certify that review, verification of products required, field dimensions, and coordination of information is in accordance with the Work as specified in the Agreement documents.

D. Provide space for the Contractor's stamp and Engineer's review stamp (approximately three and one-half inches by two and one-half inches (3½" x 2½"). Submittal shall contain Contractor's executed review and approval marking. All submittals shall be provided by the Contractor to the Engineer. Submittals that are received from Subcontractors or other sources other than through Contractor's office will be rejected without review.

E. Revise and submit resubmittal as required and identify all changes made since the previous submittal. Submission of resubmittals shall be performed in a similar manner as that of the submittals described in Paragraph 1.3 of this Specification.

F. Distribution:
   1. Distribute electronic copies of reviewed submittals to all Subcontractors and Contractor's crews whose Work will interface with the subject of the submittal.
   2. Provide additional electronic distribution of submittals (not included in other copy submittal requirements specified in this Section) to Subcontractors, suppliers, fabricators, installers, governing authorities, and others as necessary for performance of the Work.
   3. Include such additional electronic copies in transmittal to Engineer where required for status before final distribution, and show such distribution on transmittal form.

3.2 PRODUCT DATA, SHOP DRAWINGS, AND SAMPLES

A. Product Data

1. Collect required data into one (1) submittal for each unit of Work or system; and mark each copy to show which choices and options are applicable to the Work. Include manufacturer's standard printed recommendations for application of labels and seals, notation of field measurements that have been checked, and special coordination requirements.
2. Maintain one (1) set of Product Data (for each submittal) at Project Site, available for reference by Engineer, Owner, and others.
3. Submit number of copies in accordance with Paragraph 3.1.A.
4. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide all information unique to this Product.
5. After review, distribute in accordance with Paragraph 3.1.F.

B. Shop Drawings

1. Submit number of copies in accordance with Paragraph 3.1.A.
2. After review, distribute in accordance with Paragraph 3.1.F.

C. Samples

1. Provide units identical with final condition of proposed materials or products for the Work.
2. Include "range" samples (not less than three (3) units) where unavoidable variations must be expected, and describe or identify variations that must be expected, and describe or identify variations between units of each set.
3. Provide full set of optional samples where Engineer's selection is required. Prepare samples to match Engineer's sample where so indicated.
4. Include information with each sample where so indicated. Include information with each sample to show generic description, source or product name and manufacturer, limitations, and compliance with standards. Samples are submitted for review and confirmation of color, pattern, texture, and "kind" by the Engineer.
5. Engineer will not "test" samples (except as otherwise indicated) for compliance with other requirements, which are therefore the exclusive responsibility of the Contractor.

3.3 MISCELLANEOUS SUBMITTALS

A. Construction Permits:

1. Contractor shall acquire, maintain, and submit electronic copies of all construction permits that are required to execute the Work.

B. Manufacturers' Certificates:

1. When specified in individual Specification sections, submit electronic copies of manufacturers' certificates to the Engineer.
2. Indicate that a material or product conforms to or exceeds specified requirements. Submit supporting reference date, affidavits, and certifications, as appropriate.

3. Certificates may be recent or previous test results [within one (1) year], on material or product, but must be applicable to product and acceptable to Engineer.

C. Tests and Test Reports:

1. Classify each as either "Project related" or product data, depending upon whether report is uniquely prepared for Project or a standard publication of workmanship control testing at point of production, and process accordingly.
2. All test equipment used shall be verified to be in calibration at the time of each test and test reports shall so indicate. No test shall be made without such verification. Submit calibration certificates in accordance Paragraph 3.1.A.

Table 1 - List of Submittals

Section Name	Section Number	Submittals Required	Due Date or Delivery Time
Survey Control	01050	Surveyor qualifications	14 days prior to site mobilization
Survey Control	01050	Survey field notes	48 hours after completion of the survey
Survey Control	01050	Record survey	Prior to final payment
Construction Sequence	01100	Construction schedule	7 days prior to pre-construction meeting
Construction Sequence	01100	Three week look-ahead schedule	At weekly project meetings
Construction Facilities and Temporary Controls	01500	Construction Site Layout Plan	Prior to site mobilization
Site Safety	01525	Site Health and Safety Plan	Prior to site mobilization
Erosion and Sediment Controls	02060	Stormwater Management Plan	7 days prior to site mobilization
Reservoir Control	02065	Reservoir Control Plan	7 days prior to site mobilization
Demolition	02075	Demolition Plan	14 days prior to demolition
Dewatering	02140	Dewatering Plan	14 days prior to dewatering
Excavation	02220	Site Excavation Plan	14 days prior to site excavation
Earthwork	02323	Test data and sources of imported materials	10 days prior to delivery each material to the site
PVC Pipes	02710	PVC Pipe Product Information	14 days prior to purchase
Reclamation	02935	Reseeding plan	14 days prior to reclamation
Precast Concrete	03480	Precast Concrete & Sealant Product Data Submittal	14 days prior to purchase
Backfill Concrete and Grout	03605	Backfill Concrete Mix Design	10 days prior to delivery to site
Backfill Concrete and Grout	03605	Non-Shrink Grout Product Data	10 days prior to delivery to site
Miscellaneous Metals	05120	Shop drawings of miscellaneous metalwork	14 days prior to delivery to site
Miscellaneous Metals	05120	Manufacturer's Design, Calculations, and Data Sheets	14 days prior to delivery to site
Outlet Works Gate	11285	Certificates of compliance, shop drawings, and manufacturer's data	14 days prior to delivery to site
Dam Instrumentation	13100	Survey Data and Product Data of Staff Gage	10 days prior to delivery to site
Dry Hydrant	13200	Dry Hydrant Materials Submittal	14 days prior to purchase
Dry Hydrant	13200	Layout Plan	10 days prior to installation

- END OF SECTION 01300 -

SUPPLEMENT A

SUBMITTAL NO. _____.

ATTN: [TBD]

(Contractor Name)

(Contractor's Street Address)

(Contractor's City, State & Zip)

ATTN: (*Insert Contractor's contact name and phone number)*

FIRE ADAPTED BAILEY
ROMER RANCH POND DAM REHABILITATION DESIGN

WHEELER PROJECT NO.
1923.02

CONTRACTOR PROJECT NO.

ITEM NO.	COPIES	DESCRIPTION	PREVIOUS SUBMITTAL NO.	SPEC. SECTION NO.	PLAN SHEET NO.

SUBMITTED BY:

_____ _____
Contractor Date

SECTION 01400
QUALITY CONTROL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Quality Control.
B. Tolerances.
C. References.
D. Testing standards.
E. Cooperation.
F. Contractor quality control and testing.
G. Engineer quality assurance and testing.
H. Contractor's actions for failed quality control testing.

1.2 QUALITY CONTROL

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship to produce Work of specified quality.
B. Comply with manufacturers' instructions, including each step in sequence.
C. Should manufacturers' instructions conflict with Agreement documents, request clarification from the Engineer before proceeding.
D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances or codes indicate higher standards or more precise workmanship.
E. Perform Work by persons qualified to produce workmanship of specified quality.
F. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

1.3 TOLERANCES

A. Monitor tolerance control of installed products to produce acceptable Work. Do not permit tolerances to accumulate.
B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Agreement documents, request clarification from Engineer before proceeding.
C. Adjust products to appropriate dimensions; position before securing products in place.

1.4 REFERENCES

A. For products or workmanship specified by association, trades, or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes or these Specifications.
B. Unless a specific date is referenced in a particular Specification Section, the latest standard by date of issue that was current on the bid date shall govern.

1.5 TESTING STANDARDS

A. The latest issue or revision of the following standards and Specifications from the date of bid opening shall apply. Where more than one (1) code or standard specification applies or where local codes or standards have been adopted, the more stringent standard shall govern.

B. Earthwork quality control testing:

1.	Compaction	ASTM D698
2.	Moisture Content, Oven Method	ASTM D2216
3.	Specific Gravity	ASTM D854
4.	Particle Size Analysis	ASTM D422
5.	Liquid Limit, Plastic Limit and Plasticity Index	ASTM D4318
6.	Moisture Content, Nuclear Gage Method	ASTM D6938
7.	Field Density, Nuclear Gage Method	ASTM D6938
8.	Los Angeles Abrasion Test	ASTM C131
9.	Sodium Sulfate Soundness	ASTM C88
10.	Relative Density	ASTM D4253, D4254

C. Concrete and grout quality control testing:

1.	Sampling Fresh Concrete	ASTM C172
2.	Unit Weight	ASTM C138
3.	Air Content	ASTM C231
4.	Slump	ASTM C143
5.	Temperature	Thermometer
6.	Concrete Test Cylinders	ASTM C31
7.	Capping Concrete Cylinders	ASTM C617
8.	Compressive Strength	ASTM C39
9.	Split tensile strength	ASTM C496
10.	Concrete Cores	ASTM C42
11.	Mortar Cubes	ASTM C109

D. The percent compaction requirements for earthwork shall be evaluated as follows:

$$\text{Percent compaction} = \frac{(\gamma_d)\ \text{IP}}{(\gamma_d)_{max}} \times 100\%$$

Where:

(γ_d) IP = the in-place dry density of a particular soil

$(\gamma_d)_{max}$ = the maximum dry density of that same soil, determined by compaction test

E. The in-place density, as compacted, by the Contractor shall be determined by the field density test using the nuclear method.

F. The maximum dry density of the fill at the location of the in-place density test shall be estimated using a one-point compaction test and full-curve compaction tests (family of curves) of representative fill materials. Both the one-point compaction tests and the full-curve compaction tests will be performed according to ASTM D698. The one-point compaction data will be used in conjunction with the representative compaction curves to estimate the maximum dry density of the compacted fill at the location of the in-place density test. The percent compaction in-place shall be calculated as the ratio (in percent) of the in-place dry density to the estimated maximum dry density of the compacted fill at the location of the in-place density test. The use and number of one-point compaction tests will be at the Engineer's discretion.

G. The relative density of the Filter Sand at the location of the in-place density test shall be estimated using a relative density test performed in accordance with ASTM D4253, D4254. The relative density of the filter sand in-place shall be the ratio (in percent) of the in-place dry density to the estimated relative density line determined for the tested sample of filter sand. Once an adequate compaction method is determined, the use and number of relative density tests will be at the Engineer's discretion.

1.6 COOPERATION

A. The Contractor shall cooperate with the Engineer to provide access to the Work areas, as needed, for testing and to ensure that only acceptable materials shall be incorporated into the completed Work. Contractor shall conduct operations and scheduling in a manner to allow sampling of materials and products, testing, and observation of the Work. The Contractor shall assist the Engineer and testing laboratory in obtaining samples for testing, if requested.

1.7 CONTRACTOR QUALITY CONTROL AND TESTING

A. The Engineer reserves the right to require more frequent Contractor quality control testing than specified herein. More frequent quality control testing shall be performed by the Contractor at no additional cost to the Owner. Retest for materials that do not meet the Specifications shall be paid for by the Contractor.

B. Earthwork

1. Schedule of minimum earthwork quality control will be as summarized in Table No. 1 below:

Table 1 - Contractor Quality Control for Earthwork

Material	Test	Test Schedule
Filter Sand, Aggregate Base Course	Gradation	Minimum of two tests on each material from proposed source stockpile
Embankment Fill	Gradation, plasticity, moisture content	2 tests each on representative samples from each proposed source
Riprap bedding	Gradation	2 tests on materials from proposed source
Riprap	Los Angeles Abrasion, Sulfate Soundness, Specific Gravity	2 tests each on materials from proposed source
Filter Sand	Relative Density	1 test per source

C. A test fill shall be performed prior to the first placement of filter sand to ensure that the Contractor's proposed method for filter sand placement and compaction meets the relative density and breakdown requirements defined in Section 02323: Earthwork. Methods for filter sand placement are subject to approval of the Engineer.

D. Provide mix designs for structural concrete in accordance with Specification Section 03480: Precast Concrete.

E. Provide mix designs for backfill concrete in accordance with Specification Section 03605: Backfill Concrete and Grout.

F. The Contractor shall retain a NICED-certified independent testing laboratory or a laboratory that conforms to ASTM E329 to perform Contractor's laboratory tests. The laboratory shall have at least five (5) years of experience in soil and rock testing, concrete testing, and shall be equipped to perform all laboratory tests specified in Table 1. A test fill placement of filter sand shall be performed to evaluate methods responsibility.

1.8 ENGINEER QUALITY ASSURANCE AND TESTING

A. General

1. Construction activities shall be observed by the Engineer to verify general conformance with the Approved Construction Drawings and Specifications.
2. The Engineer shall have the authority to reject defective material or workmanship and require the Contractor to either correct any defective Work or remove it from the Site and replace it with non-defective Work at no additional cost to the Owner.
3. Engineer quality control testing for Earthwork is summarized in Table 2 below:

Table 2 – Engineer Quality Assurance for Earthwork

Material	Test	Test Schedule
Embankment Fill	Gradation and Atterberg	Minimum one test from borrow area or stockpile for each material
Embankment Fill	Standard Proctor	Minimum one test on samples from approved stockpile for each material at startup;
Embankment Fill	Field density and moisture content	Minimum two tests per compacted lift, or minimum two daily when fill is placed
Filter Sand	Gradation	Minimum one test
Filter Sand	Relative Density	One test per day when filter sand is being placed
Riprap Bedding	Visual observation of sizes	Every truck load delivered to site, in stockpile
Aggregate Base Course	Gradation	One test per source
Riprap	Visual observation of sizes	Every truck load delivered to site, in stockpile

4. The Engineer may perform additional laboratory tests on earthwork materials to check Contractor's test results. If additional testing by the Engineer is required, then the Contractor shall provide adequate samples to the Engineer for testing.

B. Concrete

1. The Engineer will perform testing on structural concrete.
2. Record the following information for every truck load or ten (10) cubic yards of delivered concrete;
   a. Temperature.
   b. Slump.

c. Air content.
d. Admixtures.
e. Time of sample.
f. Unit weight.
g. Feature/location of placed concrete.
h. Concrete cylinder numbers, if test cylinders are required.
i. Truck number.
j. Time start and complete.
k. The concrete batch ticket shall contain all of the information specified in ASTM C94.

3. Prepare concrete test cylinders as follows:
   a. Structural concrete: a minimum of one (1) set for every placement at an interval of every fifty cubic yards (50 cy) placement or fraction thereof.
   b. Backfill concrete: at least one (1) set and additional set at the Engineer's discretion.
4. Each set of cylinders will consist of a minimum of five (5) cylinders.
5. Note on Record Drawings placement locations represented by test cylinders.
6. Laboratory testing of test cylinders:
   a. Perform compression tests: Test two (2) cylinders from each set at seven (7) days, and two (2) from each set at twenty-eight (28) days, in accordance with ASTM C39. Maintain the last cylinder for each set for testing in the event that the twenty-eight (28) tests fall below required strength.

C. The Engineer may perform additional tests beyond what is listed above as deemed necessary by the Engineer.

PART 2 - PRODUCTS

(Not used)

PART 3 - EXECUTION

3.1 GENERAL PROVISIONS

A. The Contractor shall give the Engineer a minimum of twenty-four (24) hours' notice of readiness of the Work for all required inspections, tests, or approvals. A minimum of seven (7) days' notice is required for approval of foundations or excavated subgrades under structures.

B. If any law, ordinance, rule, regulation, code, or order of any public body having jurisdiction requires any Work (or part thereof) to specifically be inspected, tested, or approved, Contractor shall assume full responsibility therefore, pay all costs in connection therewith, and furnish the Engineer the required certificates of inspection, testing or approval. Contractor shall also be responsible for and shall pay all costs in connection with any inspection or testing required in connection with the Engineer's acceptance of a manufacturer, fabricator, supplier, or distributor of materials or equipment.

C. If the Engineer considers it necessary or advisable that covered Work be observed by the Engineer or inspected or tested by others, the Contractor, at the Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as the Engineer may require, that portion of the Work in question, furnishing all necessary labor, material, and equipment. If it is found that such Work is defective, Contractor shall bear all the expenses of such uncovering, exposure, observation, inspection, and testing, and of satisfactory reconstruction, including compensation for additional professional services. If, however, such Work is not found to be defective, Contractor shall be allowed an increase in the Agreement price or an extension of the Agreement time, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, and reconstruction.

3.2 CONTRACTOR'S ACTIONS FOR FAILED QUALITY CONTROL TESTING

A. Unless otherwise required by the Engineer or provided for in these Specifications, all defective materials, equipment, and work shall be promptly reworked, repaired, removed, or replaced as required by the Engineer. The defective materials, equipment, or work shall be re-tested to the satisfaction of the Engineer. The Contractor shall perform all such actions necessary to correct defective materials, equipment, or Work at no additional cost to the Owner. Actions required by Contractor shall be as outlined below or as described elsewhere in these Specifications.

B. All retesting of material that previously failed, and all actions necessary for concrete coring, additional concrete curing, and correction of defective materials, equipment or Work shall be performed at no additional cost to the Owner.

C. Earthwork

1. The Engineer will inform the Contractor when the product quality, in-place density, or moisture content tests results of earthwork materials do not meet the requirements of these Specifications.
2. At the Contractor's discretion, the Contractor may submit a recheck sample for additional testing. If the recheck sample fails, then the stockpile or proposed source shall be rejected. Obtaining and testing for recheck samples shall be at no additional cost to the Owner.
3. Any compactor not meeting size and weight requirements shall be rejected. Operating frequency shall be adjusted to within specified limits. Decrease rolling speed to within specified limits.

D. Concrete

1. Definition of Failure
   a. Cast specimens - Specimens cast in the field will be considered to have failed when the strength requirements do not meet the requirements of ACI 301.
   b. Cored specimens - If cored concrete testing is required, the definition of failure shall be as defined by ACI 301.
2. Failure of test specimens
   a. When test specimens are made, cured, and tested in accordance with this Specification fail as defined above, repairs can be made to bring the concrete into compliance by methods described in ACI 301.

3. At the Owner's discretion, the price of concrete or grout may be reduced by the acceptance and pay factors documented in Section 301.17 of the Colorado Department of Transportation Standard Specifications for Road and Bridge Construction.

- END OF SECTION 01400 -

SECTION 01500
CONSTRUCTION FACILITIES & TEMPORARY CONTROLS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Submittals
B. Temporary Utilities: Electricity, telephone service, water, and sanitary facilities.
C. Temporary Controls: Protection of the Work, dust control, site access, and water control.
D. Security.
E. Construction Facilities: Progress cleaning, waste removal, temporary buildings.
F. Removal of utilities, facilities, and controls.
G. Staging and stockpile areas.
H. Parking
I. Weather protection.

1.2 SUBMITTALS

A. The Contractor shall submit a Construction Site Layout Plan to the Engineer in accordance with the requirements of Specification Section 01300: Submittals. As a minimum, the Construction Site Layout Plan shall clearly show the location of the following Site features:
   1. The Contractor's proposed parking areas and construction facilities.
   2. Location(s) of material staging and stockpile areas
   3. Location(s) of temporary construction access roads.
   4. Signs and barriers for public safety.
   5. Other pertinent construction Site features.

1.3 TEMPORARY ELECTRICITY

A. On-site electricity is not available for the Contractor's use. If electrical power is required, it shall be provided by portable generators supplied by the Contractor.

1.4 TELEPHONE AND RADIO SERVICE

A. The Contractor is responsible for maintaining a working cell phone at the Site during all work hours. The Contractor shall advise all personnel working on the Site of the location of the Site cell phone.

1.5 TEMPORARY WATER SERVICE

A. The Contractor is responsible for providing fresh, sanitary drinking water for all construction personnel, Subcontractor's personnel, the Engineer's field representatives, and the Owner's field representatives.
B. Water for construction purposes is not available onsite. The Contractor must supply construction water through the duration of the project.

1.6 TEMPORARY SANITARY FACILITIES

A. The Contractor shall provide and maintain portable sanitary facilities for construction personnel, the Engineer's field representative, and other Project visitors. Provide at least one weather-tight, painted sanitary toilet facility within the Project Site throughout the entire construction period. Promptly remove the toilet(s) from the Site when no longer required and disinfect and clean the area as required.

B. Maintain sanitary toilet facilities in accordance with applicable local, state, and federal health requirements. Keep all toilet facilities clean and supplied with toilet paper and hand sanitizer at all times.

1.7 WATER CONTROL

A. Grade Site and access roads to drain and protect the Work Site from excessive running or puddled water. Provide water barriers, as required, to protect Site from soil erosion. Use cofferdams, diversion pipes and ditches, or other similar methods to prevent damage to Work areas and permanent Work. The on-site Engineer's field representative shall approve such methods to be consistent with permit approvals.

1.8 DUST CONTROL AND SNOW REMOVAL

A. Provide labor and equipment for watering to control dust on the Work Site on a daily basis. Water shall be applied at such a rate so as not to cause runoff from areas watered. The Contractor is responsible for keeping dust from leaving the construction Site throughout the entire construction period.

B. Provide labor and equipment for snow removal of the jobsite and access roads including but not limited to clearing access roads, parking areas, staging areas, stockpiles and other working areas and maintaining access to the project office and other pertinent locations within the jobsite.

1.9 PROTECTION

A. The Contractor shall protect installed Work and provide special protection where specified in individual Specification sections.

B. The Contractor shall protect Work areas and installed Work from inclement weather to maintain all materials, apparatus, fixtures, and Work free from damage whether in shipment, in storage, or in place. The Contractor shall provide special protection where specified in individual Specification sections.

C. The Contractor shall provide construction signs to warn the public to stay away from the Work Site. The location, number, and type of the signs shall be included in the construction layout plan.

D. The Contractor shall locate all utilities on the Site prior to initiating any Work on the Site.

1.10 SECURITY

A. The Contractor is solely responsible for providing security for the Contractor's equipment, completed Work, and materials stored on-Site. Any damage or theft of equipment, completed work or materials on-Site shall be replaced at the Contractor's sole expense.

1.11 PROGRESS CLEANING

A. The Contractor shall, at all times, keep the construction area, including storage areas, free from accumulations of waste materials, cleared vegetation, or rubbish.

B. In the event of the Contractor's failure to perform the above Work, the Work may be performed by the Owner, at the expense of the Contractor, and the Contractor's surety or sureties shall be liable, therefore.

C. The Contractor shall provide a trash receptacle for disposal of waste for the duration of construction. The Contractor is responsible for emptying and disposal of all waste in the trash receptacle.

1.12 REMOVAL OF UTILITES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, and materials prior to the final application for payment inspection.

B. Clean and repair damage caused by installation or use of temporary Work.

1.13 CONTRACTOR PARKING AREAS

A. Parking for the employees of the Contractor, the Engineer's personnel, and Owner's personnel will be allowed only in the limits of disturbance shown in the Approved Construction Site Layout Pan Submittal.

B. Other required parking areas at the Site shall be approved in writing by the Owner.

PART 2 - PRODUCTS

(Not used)

PART 3 - EXECUTION

(Not used)

- END OF SECTION 01500 -

SECTION 01525
SITE SAFETY

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Responsibility and requirements for Site health and safety.

1.2 SUBMITTALS

A. The Contractor shall prepare and submit a Site Health and Safety Plan in accordance with the requirements of Specification Section 01300: Submittals. The Engineer and Owner will review the plan for general conformance with the requirements listed below. The Engineer review will not constitute an approval of the plan nor will the review relieve the Contractor of full responsibility for Site health and safety. The Contractor's Site Health and Safety Plan shall include the following minimum items:

1. Details of on-Site safety procedures.
2. A list and location summary of on-Site safety features, such as first aid kits, fire extinguishers, and a list of persons trained in first aid.
3. The name and qualifications of the Contractor's on-site safety professional and the name and qualifications of the safety professional's designated alternates when the Site safety professional is not on-Site.
4. Emergency response plan including location and routes to local medical facilities and a list of emergency phone numbers.
5. Procedures and actions to be taken, if there is a fire or explosion.
6. Procedures and safety protocols to ensure that there are no volatile fumes present inside structures when Work or inspections are being done inside the structure.

1.3 RESPONSIBILITY

A. The Contractor shall become familiar with and comply with all Owner Safety Polices.

B. The Contractor shall be solely and completely responsible for initiating, maintaining, and supervising all Site safety precautions and programs in connection with the Work. Precautions shall be taken to prevent injury to employees, Owner's personnel, Engineer's personnel, and other persons that may be at the Work Site or affected by the Contractor's actions. The Contractor's responsibility for safety is continuous throughout the duration of the Work and is not limited to the actual hours of construction operations.

C. The Contractor shall not require a laborer, mechanic, or person employed in the performance of the Agreement to work in any conditions that are unsanitary, hazardous, or dangerous to health and safety, as determined under construction safety and health standards promulgated by the Secretary of Labor under Section 107 of the Contractor Work Hours and Safety Standards Act (40 USC 327 et seq.) as amended. Construction Safety and Health Standards promulgated by the Secretary of Labor may be obtained from the regional or area office of the Occupations Safety and Health Administration, U.S. Department of Labor.

D. The Contractor shall maintain an accurate record of, and shall report to the Owner in the manner prescribed by the Owner, all cases of death, occupational diseases, or

traumatic injury to employees or the public; and property damage in excess of two thousand, five hundred dollars ($2,500.00), incident to performance of Work under this Agreement.

E. The rights and remedies of the Owner provided in this paragraph are in addition to any other rights and remedies provided by law or the Agreement.

F. In the event there is a conflict between the requirements contained in the Specification paragraphs; Contractor's approved safety program; referenced safety and health codes and standards; Owner Safety Program or Appendices; or the U.S. Department of Labor construction safety and health standards, promulgated under Section 107 of the Contract Work Hours and Safety Standards Act (40 USC 327 et seq.), as amended; the more stringent requirement shall prevail.

G. Comply with all relevant health and safety regulations governing the Work being performed.

H. Become familiar with the potential hazardous health and safety conditions and risks associated with the Work to be performed.

I. Provide a fire extinguisher in the Contractor's field office and in any enclosed shed. Extinguisher shall be of the non-freeze type ABC of not less than ten pound (10 lb.) capacity.

J. Post a "HARD HAT AREA" sign at the construction Site.

1.4 FIRST AID

A. Prepare and maintain a basic first aid kit for use by workers.

B. Assure that at least one (1) person on-Site for each shift has been trained in first aid and carries a current card certifying such training.

C. Provide first aid supply commensurate with size of the Project with items necessary for first aid treatment of all injuries.

D. Advise all workers of the location of the first aid supplies.

E. Post telephone number of nearest hospital or ambulance service and fire station in a conspicuous location. Advise all workers of location of telephone numbers.

F. Advise all workers of the location and operation of working cell phones or radios that shall be on-Site during all working hours.

1.5 STOP WORK ORDER

A. When violations of the health and safety requirements or unsafe conditions are called to the Contractor's attention by anyone on the Project Site, the Contractor shall immediately take remedial action.

B. If, following anyone's request for remedial action, the Contractor fails or refuses to take prompt corrective action, the Engineer's on-site field representative or the Owner may issue an order to stop all or a portion of the Work. When satisfactory corrective action is taken, an order to resume Work will be issued. The Owner's issuance of a Stop Work Order does not relieve the Contractor of full and complete responsibility for Site safety.

PART 2 - PRODUCTS

(Not used)

PART 3 - EXECUTION

(Not used)

- END OF SECTION 01525 -

SECTION 01552
STAGING AND BORROW AREAS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Requirements for Contractor Operations associated with Staging and Stockpile Areas

1.2 STAGING AND STOCKPILE AREAS

A. The Contractor shall establish the Contractor's staging and stockpile areas and temporary construction facilities within the limits of disturbance shown on the Approved Construction Drawings. The Owner reserves the right to order specific locations for the Contractor's temporary construction facilities.

B. Any temporary earthwork, excavation, clearing, grubbing, stripping, or grading in the staging and stockpile areas by the Contractor for setting up and maintaining this area shall be approved by the Owner and performed in accordance with Specification Section 02100: Site Clearing.

C. The staging and stockpile areas shall be reclaimed at the end of construction, in accordance with Specification Section 02935: Reclamation.

D. All construction materials shall be stockpiled in the Contractor staging and stockpile areas as shown on the Approved Construction Site Layout Plan Submittal.

E. Stockpiling of materials outside of the limits of Site disturbance shall require the approval of the Owner.

F. All Site grading and temporary excavation and earthwork should be excavated in a manner that provides positive surface drainage away from the excavations and limits the concentration of surface runoff that can result in surface erosion.

1.3 BORROW AREAS

A. With the exception of approved excavated Embankment Fill obtained from the Work Site, Staging and Stockpile Areas, and on-site excavation and demolition within the limits of Site disturbance shown on the Approved Construction Drawings, the Contractor is responsible for obtaining all construction material for the Work from off-site sources.

PART 2 - PRODUCTS

(Not used)

PART 3 - EXECUTION

(Not used)

- END OF SECTION 01552 -

SECTION 01600
MATERIALS AND EQUIPMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Transportation and handling
B. Storage and protection
C. Product options.
D. Substitutions

1.2 TRANSPORTATION AND HANDLING

A. Transport and handle Products in accordance with manufacturer's instructions.
B. Promptly inspect shipments to ensure that Products comply with requirements, quantities are correct, and Products are undamaged.
C. Provide equipment and personnel to handle Products by methods to prevent soiling, disfigurement, or damage.

1.3 STORAGE AND PROTECTION

A. Store and protect Products in accordance with manufacturers' instructions, with seals and labels intact and legible.
B. Store sensitive Products in weather tight, climate controlled enclosures.
C. For exterior storage of fabricated Products, place on sloped supports, above ground.
D. Cover Products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation or potential degradation of Products.
E. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
F. Provide equipment and personnel to store Products by methods to prevent soiling, disfigurement, or damage.
G. Arrange storage of Products to permit access for inspection. Periodically inspect to verify Products are undamaged and are maintained in acceptable condition.

1.4 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Any Product meeting those standards or description.
B. Products Specified by Naming One or More Manufacturers: Products of manufacturers named and meeting specifications, no options or substitutions allowed.
C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named in accordance with the following article.

1.5 SUBSTITUTIONS

A. Engineer will consider requests for Substitutions only after date of Owner Contractor Agreement.
B. Substitutions may be considered when a Product becomes unavailable through no fault of the Contractor.
C. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.

D. A request constitutes a representation that the Contractor:
   1. Has investigated proposed Product and determined that it meets or exceeds the quality level of the specified Product.
   2. Will provide the same warranty for the Substitution as for the specified Product.
   3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
   4. Waives claims for additional costs or time extension related to substitution which may subsequently become apparent.
   5. Will reimburse Owner and Engineer for review or redesign services associated with re approval by authorities.

E. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

F. Substitution Submittal Procedure:
   1. Submit an electronic copy of request for Substitution for consideration. Limit each request to one proposed Substitution.
   2. Submit shop drawings, product data, and certified test results attesting to the proposed Product equivalence. Burden of proof is on proposer.
   3. The Engineer will require at least 7 calendar days to review the substitution submittal and will notify Contractor in writing of decision to accept or reject request.

PART 2 - PRODUCTS

(Not used)

PART 3 - EXECUTION

(Not used)

- END OF SECTION 01600 -

SECTION 02060
EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Furnishing, maintaining, and removing silt fence, silt barriers, sediment ponds, or other Best Management Practices (BMPs) to prevent pollution of waterways from construction activities.

1.2 SUBMITTALS

A. A Stormwater Management Plan (SWMP) shall be submitted in accordance with Section 01300: Submittals. It shall contain the following minimum information:

1. Facilities, products, and procedures to meet the requirements of the State and County Guidelines.
2. Procedure, installation details of constructing all required erosion protection and sediment control facilities.
3. Procedures and schedule to inspect, maintain, monitor, and repair erosion protection and sediment control facilities during the project.
4. Product data of proposed materials to be used to control erosion and sediment at the work site.
5. Schedule of removal of sediment and erosion control devices.

B. A Construction Stormwater Permit approved by the Colorado Department of Public Health and Environment is not required for the project, as disturbance areas are less than one acre.

PART 2 - PRODUCTS

2.1 SILT BARRIERS

A. Silt barriers shall include hay bales, silt fences, and other similar temporary soil sediment barriers for the purpose of intercepting and detaining sediment from disturbed areas during construction.

B. Silt barriers shall be firmly anchored into the ground.

2.2 SEDIMENT PONDS

A. Sediment ponds shall be formed by partial excavation or constructed embankment or other construction method that will result in formation of a basin that will retain runoff until sediment settles out.

2.3 DRAINAGE CHANNELS

A. Temporary drainage channels shall be excavated and stabilized to provide for controlled collection and routing of sediment-laden water to sediment and evaporation ponds or for diversion of clean water away from construction or disturbed site area.

B. Such temporary drainage channels shall be designed to minimize overtopping and erosion concerns in accordance with Project permit requirements.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install the silt fence or silt barriers at the locations indicated in the Contractor's approved SWMP.

B. Maintain silt fences or silt barriers at all times during construction.

C. Construct drainage channels as required for collection and control of runoff from all disturbed areas.

D. Construct sedimentation ponds at locations indicated in the Contractor's SWMP.

E. Excavation and earthwork performed as a part of construction of sedimentation ponds shall conform to Section 02220: Excavation, and Section 02323: Earthwork, of these specifications.

F. Maintain sedimentation ponds at all times during construction. Remove accumulated sediment as required and dispose of in accordance with Section 01114: Cleanup and Disposal of Waste Materials.

3.2 REMOVAL

A. Upon the approval of the Engineer, remove the silt, silt fence or silt barriers, and backfill drainage channels and sedimentation ponds at the end of construction.

B. Dispose of silt, silt fence or silt barriers, and other waste sediment control materials in a legal off-site disposal area in accordance with Section 01114: Cleanup and Disposal of Waste Materials.

C. Reclaim any sedimentation ponds as required by Section 02935: Reclamation of Disturbed Areas.

3.3 STORMWATER MANAGEMENT PLAN

A. The Contractor's SWMP shall remain on-site at all times during construction in a secured location. The SWMP shall not be removed from the Site without the permission of the Owner or the Engineer.

- END OF SECTION 02060 -

SECTION 02065
RESERVOIR CONTROL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Control of reservoir levels during construction.

B. Reservoir Control Submittal for construction.

1.2 RESERVOIR CONTROL

A. Prior to construction, the Contractor shall construct a temporary cofferdam in the Romer Ranch Pond feeder channel to cut off diversions into the pond.

B. After diversions into the pond are cut off, the Contractor shall drain the reservoir to below Elevation 8648. The reservoir is not currently equipped with a functional low-level outlet, and draining of the pond will likely require the use of pumps or other equipment.

C. After the new outlet works is constructed, commissioned, and approved by the Engineer, and after temporary reservoir controls, cofferdams, or other equipment are removed, control of the reservoir shall be by means of the new outlet gate. The Contractor is allowed to operate the gate during construction to control the reservoir level after acceptable commissioning and with written approval by the Engineer.

D. During rainstorms, the reservoir is expected to rise temporarily. After the storm, water should be released from the reservoir from the outlet works or pumped from the reservoir to allow work to be completed in the dry. Refer to Section 02140: Dewatering.

E. At the end of construction, the Contractor shall relinquish control of the gate to the Owner.

1.3 SUBMITTALS

A. The Contractor shall submit a Reservoir Control Plan. The plan shall contain, at a minimum, the following information:

1. Plan of temporary reservoir control facilities, including, but not limited to suitable cofferdams, dikes, plugs, or other protective features, temporary piping, above-ground conveyance pipes, and pumps. Manufacturers' information for temporary reservoir discharge pumps shall include pump performance curves.
2. Details of construction of temporary reservoir control facilities, including proposed materials, dimensions, limits of construction, and construction methods.
3. Schedule of installation, maintenance, and removal of temporary reservoir control facilities referenced in Section 01100: Construction Sequence. Coordinate with the construction sequence presented in Section 01100 of these Specifications, and the Contractor's proposed overall construction schedule.
4. Hydraulic calculations demonstrating appropriate hydraulic capacity of proposed pumping facilities, and conveyance piping facilities if different than that shown on the Drawings.

5. The Contractor's Reservoir Control Plan must be accepted by the Engineer, and Owner prior to installation.

1.4 SYSTEM DESCRIPTION

A. Design diversion facilities to divert water around the construction area, or convey through the area in a controlled manner, and to control the quality of the water leaving the construction area from diversion, dewatering, and other Contractor operations.

B. The Contractor shall be fully responsible and liable for maintaining reservoir levels and making downstream releases during all work with the facilities documented in the Reservoir Control Plan.

C. The Contractor shall be fully responsible for any damage to existing facilities, in-progress Work, or completed Work that occurs as a result of the operation or misoperation of the temporary reservoir control. This includes damage to the Owner's property, public property, private property, and the downstream population-at-risk due to dam failure.

D. Contractor shall be responsible for all energy costs provided by portable generators related to operation of the temporary reservoir release facilities.

E. The Owner shall provide a written notice to the Contractor of the date that the Contractor shall be responsible for maintaining reservoir levels as required by this Specification Section. This date will not occur before the Contractor is able to mobilize to the site and install temporary reservoir control.

F. The Owner shall resume the responsibility for reservoir operations and stream releases after the final inspection has been completed, and the work is deemed acceptable by the Owner, Engineer.

G. The Contractor shall not remove any temporary reservoir and release facilities until the project work has been completed and accepted. The Contractor must obtain written authorization from the Engineer prior to removing any temporary reservoir control facilities.

H. The Contractor shall continuously maintain, monitor, and operate temporary construction facilities 24 hours per day, for the duration of the work. This shall include maintaining suitable backup generators, pumps, bypass piping and other facilities to keep the system in continuous operation. All work shall be immediately suspended at any time that the Contractor's temporary reservoir control system becomes inoperable.

I. It shall be the responsibility of the Contractor to determine and to provide the appropriate level of construction flood protection to minimize the risk of damage to the Work, Romer Ranch Pond Dam, and its appurtenances. Temporary reservoir control features shown on the Approved Construction Drawings are for illustrative purposes only. The Contractor is responsible for planning, designing, maintaining, and operating their own temporary reservoir control facilities in accordance with the Approved Temporary Reservoir Control Plan submittal. If additional pumps or facilities are required beyond what is included in the Approved Temporary Reservoir Control Plan the Contractor shall provide and operate the additional equipment and facilities at no additional cost to the Owner.

1.5 AVAILABLE DATA

A. The reservoir volume, spillway discharge, and outlet works discharge rating curves provided in the Approved Drawings may be used to design the temporary reservoir control system.

B. The Contractor shall prepare to have additional pumping or bypass capacity available to lower the reservoir during or after major storm events.

C. The Contractor is solely responsible for any interpretations of available data used to plan, design, and operate the temporary reservoir control system during construction.

D. Flooding events are estimated using StreamStats software by the U.S. Geological Survey. Flood events are detailed in Table 02065-1. Flooding events shown in this table are for 24-hour storms and are estimated only. Actual flooding events may vary from those shown in the table.

Table 02065-1: Estimated Flood Events

Storm Frequency	Peak Inflow (cfs)
2-year	29.2
5-year	44.3
10-year	54.6
25-year	68.8
50-year	83.5
100-year	94.9

1.6 PERMITS

A. The Contractor shall be responsible for compliance with all permit conditions and shall be responsible for any water quality violations, penalties, fines, and work suspensions resulting from construction activities.

1.7 MAINTENANCE

A. Maintain all diversion, water quality protection, and erosion control facilities as needed to meet specification and permit requirements.

B. Repair any damage resulting from diversion operations at no cost to the Owner.

PART 2 - PRODUCTS

(Not used)

PART 3 - EXECUTION

3.1 GENERAL

A. The Contractor shall devise a water handling and diversion plan suitable for construction that meets the specifications herein. The Contractor shall address and devise a water handling plan that:

1. Provides sufficient water storage and/or conveyance for flooding flows up to the 2-year storm event to be stored or passed safely through the Project Site.
2. For a cofferdam, the Contractor will be required to determine the amount of freeboard based upon his tolerance of risk for events larger than the 2-year storm event.

3. The outlet works may be used for reservoir control once they have been inspected and approved by the Owner and Engineer.

3.2 REMOVAL

A. After having served their purpose, removal all temporary diversion facilities and protective works as required by the Engineer so as not to interfere with the operation or usefulness of the reservoir, pipelines, channels, and other facilities. Remove temporary diversion facilities and protective works only after approval of the Engineer.

- END OF SECTION 02065 -

SECTION 02075
DEMOLITION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Demolition and removal of the existing low level outlet, gate operator, and gate pedestal.

1.2 INFORMATION ON EXISTING FACILITIES

A. Record drawings of Romer Ranch Pond are not available. Available survey, material, and dimensional information are provided in the Drawings.

1.3 SUBMITTALS

A. Submit a Demolition Plan in accordance with Section 01300: Submittals for removing the items designated for removal as shown in the Drawings and specified herein. The Demolition Plan shall fully describe the proposed equipment and method(s) of structure removal.

1.4 PROTECTION

A. Protect the reservoir intake from Deer Creek, except as required for temporary cofferdam construction. The location of the cofferdam shall be restored to its original condition following construction.

B. Protect the existing service spillway conduits. Damage to the existing conduits shall be repaired by the Contractor to the satisfaction of the Engineer and at no additional cost to the Owner.

C. Protect the existing emergency spillway channel. Damage to the existing emergency spillway channel shall be repaired by the Contractor to the satisfaction of the Engineer and at no additional cost to the Owner.

PART 2 - PRODUCTS

(Not used)

PART 3 - EXECUTION

3.1 PREPARATION

A. Verify the existing structures are consistent with the information provided on the Drawings. Notify the Engineer if there are any discrepancies.

B. Confirm dimensions of project features that are designated on the Drawings to be field verified.

3.2 DEMOLITION OF EXISTING STRUCTURES

A. Demolish existing structures, including but not limited to the existing low level outlet, gate operator, and gate pedestal.

B. All materials from the demolition of structures shall be disposed of off-site. Refer to Section 01114: Cleanup and Disposal of Waste Materials.

- END OF SECTION 02075 -

SECTION 02100
CLEARING AND STRIPPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Provisions for topsoil stripping and clearing and grubbing within the limits of Site disturbance as shown on the Approved Construction Drawings.

1.2 DEFINITIONS

A. Clearing: Shall consist of the removal and disposal of trees, stumps, brush, snags, and debris as needed to complete the Work within the limits of Site disturbance. Trees, snags, and stumps shall be cut so that stump heights do not exceed one (1) foot above the ground. Clearing operations shall be conducted in a manner that will prevent damage to vegetation outside the limits of Site disturbance.

B. Grubbing: Shall consist of the removal of all roots, stumps, brush, and small trees left from clearing, metallic materials, and foreign debris in areas where permanent features are to be constructed or as directed by the Engineer or the Owner

C. Topsoil: Topsoil shall be defined as the top 12 inches of soil below locations where Embankment Fill is required, and the top 6 inches of soil in other work areas. The Engineer has the right to determine what soil is defined as topsoil based on the Engineer's field representative's observations.

1.3 CLEARING AND GRUBBING LIMITS AND PROTECTION

A. If clearing and grubbing beyond the specified limits of Site disturbance becomes necessary, it shall be performed only upon written approval by the Engineer.

B. Protect existing benchmarks and movement monuments that are to remain in-place, as shown on the Drawings.

PART 2 - PRODUCTS

(Not used)

PART 3 - EXECUTION

3.1 STRIPPING AND STOCKPLING TOPSOIL

A. Strip topsoil in the Contractor staging and stockpile areas and work areas as directed as the Engineer.

B. Stockpile topsoil at the staging and stockpile areas. Stockpile height shall not exceed 8 feet. Protect stockpiled topsoil from wind and water erosion.

C. Do not dispose of any topsoil until reclamation of disturbed areas are completed, and there is excess material. Excess topsoil shall be disposed of off-site, and in accordance with the requirements of Section 01114 of these specifications.

3.2 DISPOSAL OF CLEARED VEGETATION

A. Vegetation removed from clearing and grubbing shall be disposed of off-site, in accordance with Section 01114 of these specifications.

- END OF SECTION 02100 -

SECTION 02140
DEWATERING

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies performance of dewatering required to lower and control ground water table levels and hydrostatic pressures to permit excavation, backfill, and construction to be performed in the dry. Control of surface water shall also be considered as part of the work under this specification.

1.2 SUMMARY

A. The work to be completed by the Contractor includes, but is not necessarily limited to the following:

1. Implementation of dewatering items of the Erosion and Sedimentation Control Plan as described in Section 02060: Erosion and Sediment Control.
2. Dewater excavations, including groundwater and surface water from precipitation.
3. The Contractor shall be responsible for providing all materials, equipment, labor, and services necessary for care of water and erosion control. Excavation work shall not begin before the components of the Erosion and Sedimentation Control Plan are in place.

1.3 DEWATERING RESPONSIBILITY

A. The Contractor shall comply with all applicable permits, environmental protection laws and requirements in operation of the dewatering system(s).

B. The Contractor is responsible for maintaining foundations and other parts of the Work free from water as required for constructing each part of the Work. The contractor shall provide all materials and labor to install and maintain all dewatering sumps, including pumps, piping, sump pits and backfill, and other facilities for the control, collection, and disposal of groundwater for proper construction of all contract Work.

C. The Contractor shall, at all times during construction, provide ample means and devices to remove promptly and dispose of properly all water entering excavations and keep the bottoms of the excavations firm and free of standing water until the structures to be built therein are completed or the backfill to be placed therein has been placed. The pumping and dewatering operations shall be carried out in such a manner that no disturbance to the bearing soil supporting any other Work will result from the dewatering operations. The dewatering discharge shall not cause siltation or other negative environmental impact on natural waterways or other property; such discharge shall be in accordance with applicable Federal, State, and local regulations and Project permits.

D. The dewatering system(s) shall be operated continuously as necessary to prevent flotation of partially completed structures or other Work.

1.4 REQUIREMENT

A. Dewatering system shall be of sufficient size and capacity necessary to lower and maintain the ground water table to an elevation at least 2 feet below the lowest foundation subgrade or concrete placed, in a reasonably dry condition. Materials to

be removed shall be sufficiently dry to permit excavation to grades shown and to stabilize excavation slopes where sheeting is not required. Operate dewatering system continuously until backfill work has been completed.

B. Prevent loss of fines, seepage, boils, quick conditions or softening of foundation strata.

C. Maintain stability of sides and bottom of excavation.

1.5 SUBMITTALS

A. Submit a Dewatering Plan per Section 01300: Submittals that includes:

1. Location, depth and size of wellpoints, headers, sumps, ditches, size and location of discharge lines, capacities of electric pumps and standby units, and detailed description of dewatering methods to be employed to convey the water from site to adequate disposal.
2. Design calculations proving adequacy of system and selected equipment. The dewatering system shall be designed using accepted and professional methods of design and engineering consistent with the best modern practice.

PART 2 - PRODUCTS

(Not used)

PART 3 - EXECUTION

3.1 INSTALLATION

A. Reduce hydrostatic pressure head in water-bearing strata below structure foundations, utility lines, and other excavations, to the extent that water levels in the construction area are a minimum of 2 feet below the lowest excavation surface at all times.

3.2 OPERATION

A. Prior to any excavation below the ground water table, place system into operation to lower water table as required and operate it continuously, 24 hours a day, 7 days a week until utilities and structures have been satisfactorily constructed, which includes the placement of backfill materials, and dewatering is no longer required.

B. Place an adequate weight of backfill material to prevent buoyancy prior to discontinuing operation of the dewatering system.

3.3 WATER DISPOSAL

A. Dispose of water removed from the excavations in such a manner as:

1. Will not damage portions of the Work currently under construction or already completed.
2. Will cause no inconvenience to the Owner or to others working near site.
3. Will comply with the stipulations of required permits for disposal of water.

3.4 CORRECTIVE ACTION

A. If dewatering requirements are not satisfied due to inadequacy or failure of the dewatering system (loosening of the foundation strata, or instability of slopes, or damage to foundations or structures), perform work necessary for reinstatement of foundation soil and damaged structure or damages to work in place resulting from such inadequacy or failure by Contractor, at no additional cost to the Owner.

3.5 DAMAGES

A. Immediately repair damages to adjacent facilities caused by dewatering operations.

3.6 REMOVAL

A. Ensure compliance with all conditions of regulating permits and provide such information to the Engineer. Obtain written approval from the Engineer before discontinuing operation of dewatering system.

- END OF SECTION 02140 -

SECTION 02220
EXCAVATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Excavation in the embankment.

B. Additional excavation as shown on the Drawings or as directed by the Engineer.

1.2 DEFINITIONS

A. Soil: Soil includes all earth materials ranging from clays, silts, sand, gravel, and cobbles.

B. Foundation Subgrade: the bearing surface upon which a structure or fill is to be placed.

C. Riprap: Existing onsite rock rubble larger than 12-inches in diameter

1.3 SUBMITTALS

A. The Contractor shall submit an excavation plan for the Site that documents the lines and grades for all Site excavations. The plan shall document any required braced excavations and document the design and calculations for braced excavation systems, if needed. All braced excavation systems must be designed by a Registered Colorado Professional Engineer.

1.4 PROTECTION

A. Comply with federal, state, and local laws and regulations regarding excavation safety.

B. Conform to applicable provisions of the Site Health and Safety Plan; refer to Section 01525, Site Safety.

C. Protect existing structures, facilities, and instrumentation designated to be protected.

D. Utility notification and coordination.

1. Contractor shall contact the Utility Notification Center of Colorado prior to beginning excavations.
2. Prior to beginning any excavations at the Site, verify the existence and location of all existing utilities within the limits of Site disturbance, whether shown on the Approved Construction Drawings or not.
3. Coordinate performance of the Work with affected utilities as necessary during construction. Notify affected utilities prior to commencing the Work, if damage occurs, or if conflicts or emergencies arise during construction.

E. Repair features designated as protected that are damaged as a result of Contractor's excavation activities, at no additional cost to the Owner and to the satisfaction of Engineer.

F. Blasting will not be allowed for the Work.

1.5 RESPONSIBILITY

A. Contractor shall be solely responsible for making all excavations in a safe manner. Provide all measures to retain excavation side slopes and prevent rock falls as necessary to ensure the safety and protection of persons in or near the excavations.

B. Contractor shall be solely responsible for the stability of all temporary slopes required or necessary for the Work. Slopes of temporary excavations shown or represented

on the Approved Construction Drawings represent the steepest slope that will be allowed; shore, sheet, brace or slope temporary slopes, as necessary, to conform with applicable regulations.

C. The Contractor shall be solely responsible for deductions and conclusions as to the nature of the materials to be excavated and the difficulties of making and maintaining required excavations.

PART 2 - PRODUCTS

(Not used)

PART 3 - EXECUTION

3.1 PREPARATION

A. Do not begin excavations until the respective dewatering facilities are in place and functioning properly. Refer to the requirements of Section 02140: Dewatering

3.2 EXCAVATION – GENERAL

A. Excavate to the Neat Lines, grades and dimensions shown on the Approved Construction Drawings.

B. Excavate subgrades to within tolerance of plus or minus 0.1-foot.

C. Allow for forms and working space wherever applicable.

D. Trim to Neat Lines where concrete is to be placed directly against earth.

E. Perform all excavation work in the dry. Refer to Section 02140: Dewatering

F. Do not excavate in frozen materials, except with written approval of Engineer.

G. Take all necessary precautions to preserve material below and beyond the established limits of excavation. Repair any damage to the Work, foundations or subgrades that are the result of Contractor's operations as required by Engineer at no additional cost to the Owner.

H. Excavation cut slopes for the mass excavation shall be performed in accordance with OSHA Trenching and Excavation Safety Requirements.

3.3 RIPRAP EXCAVATION

A. Excavated riprap that meets the requirements of new riprap shall be stockpiled and re-used.

B. Excavated concrete rubble and excavated riprap not meeting the requirements of new riprap shall be disposed in accordance with Section 01114: Cleanup and Disposal of Waste Materials.

3.4 EXCAVATED MATERIALS SUITABLE FOR EMBANKMENT FILL

A. Stockpile excavated soil materials suitable to be re-used as Embankment Fill.

B. All material obtained from on-site excavations will be visually inspected by the Engineer as excavations are performed. Based on visual inspections and laboratory test data the Engineer will determine suitability of material for use in the completed Work.

C. Stockpile materials within limits of site disturbance, in staging and stockpile areas, or other areas approved by the Engineer.

D. Remove from the Site any materials that are unsuitable for reuse in the completed Work. Refer to Section 01114: Cleanup and Disposal of Waste Materials.

E. Do not place stockpiles adjacent to excavations if weight of stockpiled material could adversely impact the stability of the excavation slopes.

F. Do not place stockpiles near or above existing facilities, adjacent property, or completed Work if weight of stockpiled material could induce excessive settlement of otherwise cause damage.

G. Do not place stockpiles on the crest or slopes of the existing dam embankment.

3.5 DISPOSAL

A. Dispose of excavated materials which are not suitable for use in the completed Work in accordance with Section 01114: Cleanup and Disposal of Waste Materials.

B. Dispose of excavated materials which are in excess of quantities needed for the completed Work in accordance with Section 01114: Cleanup and Disposal of Waste Materials.

3.6 FINISHED FOUNDATION SUBGRADE

A. Do not prepare foundations when temperatures could result in frozen ground conditions.

B. Remove frozen soil, deleterious materials, organics, or soft, yielding, or saturated areas and backfill as required by the Engineer to meet the Technical Specification requirements.

C. Proof-roll finished foundation subgrades that become loosened or disturbed by Contractor's operations. Finished foundation subgrades that become loosened or disturbed as a result of Contractor's operations shall be moisture-conditioned and compacted as required by Engineer at no additional cost to the Owner.

D. Finished foundation subgrade shall be dry, firm, and unyielding.

E. Foundations which, in the opinion of Engineer, are soft or yielding shall be excavated and backfilled with Embankment Fill or other materials as directed by the Engineer.

F. Finished foundations shall be approved by Engineer before overlying structure or fill is started.

- END OF SECTION 02220 -

SECTION 02323
EARTHWORK

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Borrowing and placing Embankment Fill
B. Borrowing and placing Filter Sand
C. Furnishing and placing Riprap
D. Furnishing and placing Riprap Bedding
E. Furnishing and placing Aggregate Base Course
F. Furnishing and placing Topsoil

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):
1. ASTM C33, Standard Specification for Concrete Aggregates.
2. ASTM C88, Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate.
3. ASTM C117, Standard Test Method for Materials Finer than 75-mm (No. 200) Sieve in Mineral Aggregates by Washing.
4. ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
5. ASTM D75, Standard Practice for Sampling Aggregates.
6. ASTM D422, Standard Test Method for Particle-Size Analysis of Soils.
7. ASTM D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft3 (600 kN-m/m3)).
8. ASTM D854, Standard Test Methods for Specific Gravity of Soil Solids by Water Pycnometer.
9. ASTM D1556, Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method.
10. ASTM D2216, Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.
11. ASTM D2488, Standard Practice for Description and Identification of Soils (Visual-Manual Procedure).
12. ASTM D3740, Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
13. ASTM D4253, Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.
14. ASTM D4254, Standard Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.
15. ASTM D4318, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
16. ASTM D6938, Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

B. Standard Specifications for Road and Bridge Construction, Colorado Department of Transportation, (CDOT Standard Specifications).

1.3 TESTS

A. Contractor: Perform quality control testing in accordance with the requirements of Section 01400: Quality Control.

B. Engineer will perform quality assurance tests on stockpiled materials, and in-place earthwork materials in accordance with the provisions of Section 01400: Quality Control.

1.4 SUBMITTALS

A. Imported soil and rock materials:

1. Proposed source for each imported material.
2. Certified test results documenting conformance with all Technical Specification requirements.
3. Do not deliver imported soil and rock materials to the Site until source and material are approved by Engineer.

1.5 DEFINITIONS

A. Deleterious Material: Organic matter, trash, rubbish, debris, oversize material.

B. Optimum Water Content:

1. That moisture content which will result in a maximum dry unit weight of the soil when subject to the ASTM D698 compaction test.

C. Percent Compaction:

1. Ratio, in percent, of as-compacted field dry density to laboratory maximum dry density as determined in accordance with ASTM D698
2. Relative compaction (%) = 100 x $(\gamma_d)_{IP}$ / $(\gamma_d)_{max}$; with:
   a. $(\gamma_d)_{IP}$ = measured in-place dry density of soil,
   b. $(\gamma_d)_{max}$ = maximum dry density of respective soil.

D. Coverage: One coverage is defined as the requirement of successive trips of a piece of compaction equipment, which by means of sufficient overlap will ensure a complete coverage of the entire surface of the layer by the equipment.

E. Topsoil: Topsoil shall be defined as the top 12 inches of soil below locations where Embankment Fill is required, and the top 6 inches of soil in other work areas. The Engineer has the right to determine what soil is defined as topsoil based on the Resident Engineer's observations.

PART 2 - PRODUCTS

2.1 EMBANKMENT FILL

A. Embankment Fill shall consist of material developed from approved excavated materials from required excavations, the soils within the borrow areas, or approved materials imported from approved off-Site sources. Embankment Fill Soils that are classified as clay and sandy clay (CL) or clayey sand (SC) in accordance with Unified Soil Classification System are acceptable as Embankment Fill. Embankment Fill Soils classified as silts (SM) or gravels (GP, GW) are not acceptable as Embankment Fill. Embankment Fill shall have a maximum particle size of 2 inches, minimum 30% passing the No. 200 sieve, and shall contain less than 1 percent organics by weight

and be free of wood, twigs, branches and grass clumps, peat, trash, and other debris, and be approved by the Resident Engineer.

B. Acceptance: Gradation, Atterberg and in-place density, organic content and moisture content shall be within specified limits.

C. The Engineer reserves the right to field verify gradation.

2.2 FILTER SAND

A. Filter Sand shall be a processed sand material in conformance with ASTM C33 Fine Aggregate and graded within the following limits:

U.S. Standard Sieve	Percent Passing by Weight
3/8 in.	100
No. 4	95-100
No. 8	80-100
No. 16	50-85
No. 30	25-60
No. 50	10-30
No. 100	2-10
No. 200	0-3

B. The fraction of the Filter Sand finer than the No. 40 sieve shall be classified as non-plastic based on Atterberg limits (ASTM D 4318 performed on the fraction of the soil finer than the No. 40 sieve). The fraction of the Filter Sand material finer than the No. 40 sieve shall be determined by ASTM D422, wet sieve method.

C. Filter Sand shall be imported from approved off-Site sources.

D. Acceptance – Gradation, Atterberg and in-place density and moisture content shall be within specified limits.

E. The Engineer reserves the right to field verify gradation.

2.3 RIPRAP

A. All riprap shall be hard, dense, durable, angular, crushed natural stone or rock.

B. Sources: Imported from approved sources or from approved excavations, meeting the gradation and quality requirements in this Technical Specification section.

C. All riprap shall have a minimum specific gravity of 2.6 (ASTM C127).

D. All riprap shall have a sodium sulfate (ASTM C-88) soundness of less than 10 percent.

E. All riprap shall have a L.A. Abrasion (ASTM C-131) less than 50 percent.

F. No flat and elongated stones are allowed. The ratio of greatest dimension to the least dimension of each stone shall be a maximum of 2.5.

G. Riprap Gradation:

1. 12-inch D50: CDOT Type M Riprap Gradation

Typical Stone Dimension	Percent of Material Smaller than Typical Stone
21	70-100
18	50-70
12	35-50
4	2-10

H. New riprap shall be imported from approved off-site sources. Existing riprap meeting requirements presented in this technical specification section, may be reused.

I. Acceptance – Visual inspection upon delivery.

J. The Engineer reserves the right to field verify gradation.

2.4 RIPRAP BEDDING

A. Riprap bedding material shall be Type II CDOT Section 703.09 Class A granular bedding or equivalent gravel meeting the following gradation requirements:

U.S. Standard Sieve	Percent Passing by Weight
3 inches	90-100
3/4 inches	20-90
No. 4	0-20
No. 200	0-3

B. Acceptance – Visual inspection upon delivery.

C. The Engineer reserves the right to field verify gradation.

2.5 AGGREGATE BASE COURSE

A. Aggregate Base Course shall meet the durability and quality requirements in CDOT Standard Specifications for Road and Bridge Construction, Section 703.03 – Aggregates for Bases, Class 5 Aggregate Base, and consist of the following grading requirements:

U.S. Standard Sieve	Percent Passing by Weight
1 1/2 inch	100
1 inch	95-100
No. 4	30-70
No. 200	3-15

B. Aggregate Base Course shall be imported from approved sources.

C. Aggregate Base Course shall be free of debris, trash, and other deleterious or organic material.

D. Acceptance – No testing needed if placed as specified.

E. The Engineer reserves the right to field verify gradation.

2.6 TOPSOIL

A. Topsoil shall be defined as the top 12 inches of soil in the borrow areas and the top 6 inches of soil in other work areas.

B. The Engineer has the right to determine what soil is defined as topsoil based on the Engineer's field representative's observations.

C. Topsoil shall be loose, friable organic loam free of stumps, roots, rocks larger than 1 inch, brush, weeds, heavy clay, and toxic substances.

D. Materials from on-site stripping meeting these requirements are acceptable for topsoil.

2.7 EQUIPMENT

A. Equipment for Embankment Fill

1. Smooth drum vibratory roller or approved equal.
   a. Minimum roller weight: 4,000 pounds per foot of drum length.
2. Self-propelled, sheepsfoot roller or tamping roller or approved equal:
   a. Minimum roller weight: 4,000 pounds per foot of drum length.

B. Equipment for Filter Sand and Aggregate Base Course:
   1. Self-propelled, smooth-drum vibratory roller or approved equal:
      a. Minimum static weight: 1,800 pounds per foot of compaction drum length.
      b. Minimum dynamic force: 8,000 pounds per foot of compaction drum length.
      c. Minimum applied dynamic force: 3,000 pounds per foot of compaction drum length.
   2. Vibratory plate compactor:
      a. Minimum static weight: 270 pounds.
      b. Minimum applied dynamic force: 1,000 pounds.

C. Approved for respective use by Engineer.

PART 3 - EXECUTION

3.1 GENERAL PLACEMENT REQUIREMENTS

A. Do not begin earthwork operations until respective dewatering systems are in place and functioning properly; refer to Section 02140: Dewatering and Section 02220: Excavation.

B. Place fills and backfills to the lines and grades shown on the Approved Construction Drawings or as otherwise required by Engineer.

C. Moisten or aerate, scarify, and work with harrows, disks, or other suitable equipment to depths that provide a good bonding surface with the new material and to remove all smooth surfaces.

D. Place in horizontal layers, or as otherwise approved by Engineer.

E. Distribute fill and backfill material such that it is free from lenses, pockets, streaks, lumps, or layers of material differing substantially in texture, gradation, or moisture content from the surrounding material, so as to form as homogeneous a layer as practical.

F. When the placement percent compaction and moisture content do not meet the Technical Specification requirements, immediately make adjustments in procedures as necessary to obtain the required results.

G. Rework in-place materials that do not meet the specified percent compaction and moisture content requirements until approved results are obtained. Rework may include removal, rehandling, reconditioning, rerolling, or combinations thereof.

H. Do not place fill when the fill, backfill or foundation on which it will be placed is frozen.

I. Stop fill and backfill placement temporarily during unsuitable weather conditions, as required by Engineer.

J. Embankment Fill shall be moisture-conditioned at the borrow area or stockpile area prior to transport to the dam.

3.2 SPECIAL COMPACTION

A. Required in the following locations:
   1. Tight, restricted or steep areas not accessible by large rollers.
   2. Within two (2) feet vertically or horizontally of new concrete structures.
   3. Within three (3) feet over pipes.

4. Trench compaction

B. Meet in-place moisture and compaction requirements for the respective material as specified in this Section.

C. Place and compact in maximum six-inch loose lifts. Remove all rocks larger than 1-inch in diameter from the special compaction area.

D. Equipment: Small, self-propelled roller; walk-behind roller; vibratory plate compactor, or other small compactor. Small compaction equipment as approved by Engineer.

3.3 FOUNDATION PREPARATION

A. Conform to requirements for Finished Foundations in Section 02220: Excavation.

B. Do not prepare foundations when temperatures could result in frozen ground conditions.

C. Remove frozen soil, deleterious materials, organics, or soft, yielding or saturated areas and backfill as required by Engineer to meet the Technical Specification requirements.

D. Proof-roll finished foundation subgrades that become loosened or disturbed by Contractor's operations, including but not limited to dewatering or unwatering. Finished foundation subgrades that become loosened or disturbed as a result of Contractor's operations shall be moisture-conditioned and compacted as required by Engineer at no additional cost to the Owner.

E. Do not place materials until the finished foundation subgrade has been suitably dewatered, prepared and approved by Engineer.

3.4 PLACING EMBANKMENT FILL

A. Place Embankment Fill as shown on the drawings in layers with a maximum loose lift thickness of 8 inches before compaction.

B. Embankment Fill shall be compacted in place to at least 95 percent of the maximum dry density. The moisture content shall be within 2% (plus or minus) of optimum when tested in accordance with ASTM D698 (Standard Proctor).

3.5 PLACING FILTER SAND

A. Maximum loose lift thickness: 8 inches before compaction.

B. Compaction requirement: Within 65 percent to 75 percent of relative density (ASTM D4253 and ASTM D4254). The number of passes needed to achieve the required density should be evaluated during initial placement to develop a method procedure for keeping the density within the above range.

C. Moisture requirement: There are no specified moisture requirements. The sand shall be thoroughly wetted immediately prior to compaction.

D. When placing Filter Sand adjacent to embankment fill, maintain the top of the Filter Sand at least six inches higher than the adjacent backfill to avoid contamination of the Filter Sand.

E. Do not over-compact Filter Sand. In order to minimize particle breakage during compaction, the Engineer will perform gradation tests on compacted samples of the Filter Sand to verify this requirement. The Contractor shall reduce the compactive effort if tests indicate there is excessive particle breakage. Excessive particle breakage occurs when there is a 2-percent or greater increase in the fines content (percent finer than No. 200 sieve).

3.6 PLACING RIPRAP AND RIPRAP BEDDING

A. Maximum loose lift thickness for riprap: As necessary to intermix different sizes of pieces to eliminate segregation, to interlock pieces, to fill voids between larger pieces with smaller pieces and to create a finished surface free from irregularities.

B. There are no compaction and moisture requirements for riprap and riprap bedding.

C. Riprap bedding shall be spread in such a manner as to form a smooth, uniform layer under the riprap.

3.7 PLACING AGREGATE BASE COURSE

A. Maximum lift thickness: 6 inches after compaction.

B. Aggregate Base Course shall be compacted with a minimum of four (4) coverages of an approved compactor. There are no moisture requirements for aggregate base course.

C. Rework materials that have not been placed in accordance with these specifications. Reworking may include removal, recompacting, reconditioning, or combinations of these procedures, as required by the Engineer.

3.8 PLACING TOPSOIL

A. Place topsoil from the onsite stockpiles where shown on the drawings and other areas requiring reclamation to a thickness of 6 inches.

B. Place topsoil on the downstream slope dam embankments to the thickness, lines and grades shown the Drawings.

C. No compaction of the topsoil is required. However, the Contractor shall track the topsoil surface with the placement equipment during placement.

3.9 BACKFILL FOR STRUCTURES

A. Backfill materials under structures and against structural walls shall include Filter Sand, Drain Gravel, and Embankment Fill, as shown on the Approved Construction Drawings.

B. Special compaction for backfill against structures is required as shown on the drawings. Refer to Paragraph 3.2 of this section. Heavy equipment shall not be allowed in the special compaction zone.

C. Backfill against structures with uniform fill on both sides shall be placed in a uniform manner such that no unbalanced loading will occur against the structures.

D. No backfill shall be placed against structures until all forms have been removed and until at least five (5) days after concrete has been placed or until the compressive strength of the concrete has attained at least seventy five percent (75%) of the twenty-eight (28) day compressive strength in any specific area, and until approved by the engineer.

3.10 TOLERANCES

A. All earthwork except riprap: Within plus or minus 0.10-foot from the grades shown on the Approved Construction Drawings or required by Engineer.

B. Riprap: Within three (3) inches above and one (1) inch below the grades shown on the Approved Construction Drawings or required by Engineer.

- END OF SECTION 02323 -

SECTION 02710
PVC PIPE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Furnishing and installing 12-inch-diameter C900 PVC pipe as shown on the Approved Construction Drawings.

1.2 REFERENCES

A. ASTM D3034 – Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

B. ASTM D5926 – Specifications for Poly (Vinyl Chloride) (PVC) Gaskets for Drain, Waste, and Vent (DWV), Sewer, Sanitary, and Storm Plumbing Systems.

1.3 SUBMITTALS

A. Submit information on the 12-inch-diameter C900 PVC pipe to be used, including:

1. Details of fittings and specials
2. Samples of all specified materials.

PART 2 - PRODUCTS

2.1 PVC PIPE

A. AWWA C-900 PVC Pipe – The twelve-inch (12") diameter AWWA C-900 PVC pipe and couplings shall have a minimum wall thickness of 0.70-inch.

B. All fittings and accessories shall be manufactured and furnished by the pipe supplier or approved equal, and have joint configurations identical to that of the pipe.

PART 3 - EXECUTION

3.1 PREPARATION

A. Do not install drain pipe or PVC pipe until the excavation and the materials under the pipe are properly dewatered, in accordance with Section 02140: Dewatering and compacted in accordance with Section 02323: Earthwork.

3.2 PIPE INSTALLATION

A. Handling and Storage: Contractor shall exercise care in the handling, storage, installation, and backfill of all pipe at the site. Pipe that is damaged during shipping, handling, storage, installation, backfilling, or work on adjacent structures will be subject to rejection by the Engineer. Rejected pipe shall be immediately removed from the site and replaced by the Contractor at no additional expense to the Owner.

B. Repair or replace all pipe damaged prior to Substantial Completion or during warrantee period.

C. Inspect each pipe and fitting prior to installation to ensure that no damaged portions of pipe are installed.

D. Before placement of pipe in the trench, thoroughly clean each pipe or fitting of any foreign substance that may have collected therein and keep the pipe clean at all times thereafter. For this purpose, close the openings of all pipes and fittings in the trench during any interruption to the work.

E. Pipe Laying: Install the pipe in accordance with ANSI/AWWA C600.

F. Pipe Cleanup: As pipe laying progresses, keep the pipe interior free of all debris. Completely clean the interior of the pipe of all sand, dirt, mortar splatter and any other debris following completion of pipe laying, pointing of joints, and any necessary interior repairs per ANSI/AWWA C600 and C602 prior to testing the completed pipeline.

3.3 PVC PIPE INSTALLATION

A. PVC piping shall be constructed to the lines, grades, slopes, and details shown on the Approved Construction Drawings.

B. Exercise care so as not to contaminate the pipes during installation.

C. Install PVC pipes with the bell end facing uphill.

- END OF SECTION 02710 -

SECTION 02935
RECLAMATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Reclaiming all disturbed areas within the limits of site disturbance as directed by the Engineer. Reclaiming disturbed areas shall include loading of topsoil from onsite stockpiles, hauling, placing, and spreading topsoil, placing seed, placing mulch, watering, and protecting the seed until an acceptable stand of grass is established.

B. Seeding, mulching, and fertilizing requirements for topsoil placed on the dam embankment.

1.2 SUBMITTALS

A. The Contractor shall submit a reseeding submittal in accordance with Section 01300: Submittals. The submittal shall include the following items:

1. Seed Mixture and Certification.
2. Plant Inspection Certification.
3. Fertilizer Identification and Certification.
4. Weed-Free Mulch Certification.
5. Proposed seeding method and equipment.

1.3 PROTECTION

A. Areas outside the approved limits of site disturbance shall be protected from damage by the Contractor. Any disturbance of vegetation or native ground outside of the limits of site disturbance shall be reclaimed by the Contractor at no additional cost to the Owner.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver grass seed mixture in sealed bags or containers. Seed in damaged packaging is not acceptable.

B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

C. Stripped material to be used for topsoiling disturbed areas shall be transported to stockpile areas conducive to storage of topsoil and approved by the Engineer. Run-off shall be diverted around topsoil stockpiles to minimize erosion.

PART 2 - PRODUCTS

2.1 SEED MIX

A. Grass seeds for all disturbed upland areas shall consist of the following mixture or approved equal:

Table 1 - Mountain Home "Firewise" Mix				
Species	**Variety**	**Percent of Mix**	**Drilled Planting (PLS lbs / acre)**	**Broadcast Seeding (PLS lbs / acre)**
Blue grama	Lovington	20	0.6	1.2
Streambank wheatgrass	Sodar	20	2.2	4.4
Western wheatgrass	Rosana	10	1.6	3.2
Thickspike wheatgrass	Critana	10	1.1	2.2
Canby bluegrass	Canbar	20	0.8	1.5
Sheep fescue	Covar	20	1.0	2.0
TOTAL		100	7.3 lb/ac	14.5 lb/ac

B. Grass seeds shall be delivered to the site in bags or containers that are unopened and clearly labeled to show the name and address of the supplier, the seed name, lot number, net weight of seed, the percentage of weed seed, the guaranteed percent purity, and the guaranteed percent germination.

C. All seed furnished shall be free from such noxious seeds such as Russian or Canadian thistle, European bindweed, Johnson grass, and leafy spurge. Seed that has become wet, moldy, or otherwise damaged in transit or storage will not be accepted.

2.2 MULCH

A. Mulch shall be threshed straw or cereal grain such as oats, wheat, barley, rye, rice, etc., or grass hay. Materials that contain objectionable weed seeds or other species detrimental to planting being established will not be acceptable.

2.3 EROSION CONTROL BLANKET (ECB)

A. Erosion Control Blanket be a straw or excelsior blanket made of 100% natural and biodegradable materials and shall be constructed with double-sided netting.

B. Erosion Control Blanket shall be appropriate for a maximum gradient of 2:1 (horizontal : vertical) and a C factor less than or equal to 0.1 for this gradient.

C. Erosion Control Blanket shall have a minimum tensile strength of 75 pounds per foot.

D. Erosion Control Blanket shall have a minimum product life of one year.

2.4 FERTILIZER

A. Use a granular commercial fertilizer that is consistent with the seed mix.

PART 3 - EXECUTION

3.1 PREPARATORY WORK

A. Reclaim all disturbed areas within the limits of disturbance per the direction of the engineer.

B. Verify with the Engineer the areas to be reclaimed and the final grading and contouring.

C. Remove all Contractor's equipment, debris, temporary fences or gates, and all other Contractor's properties in accordance with Section 01114: Cleanup and Disposal of Waste Materials.

D. Eliminate uneven areas and low spots. Remove debris, roots, branches and stones in excess of 3-inch size.

E. Scarify subgrade soil to a depth of 4 inches where topsoil is required. Scarify all other areas to receive seed that have been disturbed by equipment used for hauling and has compacted the subgrade soil.

3.2 PLACING TOPSOIL, SEED, MULCH AND FERTILIZER

A. Place topsoil in accordance with Section 02323: Earthwork.

B. Sowing Seed

1. Method - The seed mixture shall be sown by drilling with an approved disk or shoe-type grass drill or by mechanical or hand broadcasting, as approved by the Engineer. Apply the seed at a minimum rate of 40 pounds per acre.
2. Drilling Seeding - If the drill seeding method is used, the drill shall be regulated to uniformly distribute the seed at the rate specified herein on the areas to be seeded. Where possible to safely operate equipment, as approved by the Engineer, drilling shall be down crosswise to the general slope. The drill shall be regulated so that the seed is properly placed in the soil and covered with soil to a depth of ¼- to ¾-inch.
3. Broadcast Seeding - In areas inaccessible by the method prescribed above, the seed and fertilizer may be applied by either mechanical or hand broadcasting. The rates of application for the grass seed mixtures herein specified shall be doubled if sown by mechanical or hand broadcasting methods. When either of these methods are used, the seed and fertilizer shall be applied separately.
4. Mechanical Broadcasting - A mechanical broadcaster of either the centrifugal or pull type similar to fertilizer spreaders are acceptable. Any equipment of this type used for broadcast seeding shall be designed and regulated to ensure that the proper seeding rate per acre specified herein is uniformly applied on areas to be seeded.
5. Hand Broadcasting - Seed application may be performed by using any approved hand broadcaster or by broadcasting the seed by hand from a sack or other suitable container. Whichever means is used, the seed shall be uniformly applied at the rates specified herein. Immediately after broadcasting the seed and fertilizer, they shall be properly covered with soil to the depths prescribed above by means of a hand rake or float. Covering broadcast seed by dragging a log chain or similar device will not be permitted.

C. Fertilizer - The Contractor shall furnish and apply uniformly commercial fertilizer at the minimum rate of 300 pounds per acre. Fertilizer may be applied prior to seeding by suitable mechanical spreaders, blowers, or hydraulic equipment. Fertilizer may also be applied when seeding as specified above. Dry fertilizer shall not be mixed with dry seed.

D. Mulching - The Contractor shall furnish, uniformly place, and stabilize mulch within 24 hours after seeding a minimum of 2.5 tons per acre of air dry hay or 1.5 tons per acre of air dry straw on all portions of the seeded areas requiring mulch. Mulching material shall not be applied, when, in the judgment of the Engineer, the wind velocity is such as to prevent uniform distribution of the material. Mulch material may be spread by hand or by blower.

E. Providing Water for Seeded Areas - After completion of seeding operations, sufficient water to the seeded areas shall be supplied to ensure successful seed germination and to ensure that an acceptable stand of grass is established. Any erosion resulting from the Contractor's irrigation operations shall be immediately repaired and reseeded at the Contractor's expense to a condition approved by the Engineer.

F. Schedule - Sowing shall not be done when weather conditions are prohibitive to sowing. The areas which require seeding shall be seeded between October 1 and December 1 or between April 1 and June 1. Seeding shall not occur if significant snowfall is on the ground, or conditions at the project site are not conducive to seeding as determined by the Engineer.

G. Any additional seedbed preparations required shall be at the expense of the Contractor.

H. All permanently exposed surfaces, to be reclaimed, shall be seeded as soon as possible after completion of work in an area and within the time limits given above.

- END OF SECTION 02935 -

SECTION 03480
PRECAST CONCRETE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Requirements for furnishing and installing precast concrete structures including but not limited to precast concrete manhole sections, precast concrete inlet structure, and other structures as shown on the Drawings.

1.2 REFERENCES

A. AASHTO M199M: Standard Specification for Precast Reinforced Concrete Manhole Sections

B. AASHTO M259: Precast Reinforced Concrete Box Sections for Culverts, Storm Drains, and Sewers

C. ASTM C478: Standard Specification for Precast Reinforced Concrete Manhole Sections.

D. ASTM C789: Standard Specification for Precast Reinforced Concrete Box Sections for Culverts, Storm Drains, and Sewers

E. ASTM C857: Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures.

F. ASTM C858: Standard Specification for Underground Precast Concrete Utility Structures.

G. ASTM C990: Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants

H. ASTM C1786: Standard Specification for Segmented Precast Reinforced Concrete Box Sections for Culverts, Storm Drains and Sewers designed According to AASHTO LRFD.

1.3 SUBMITTALS

A. Precast concrete shop drawings shall be submitted to the Engineer prior to fabrication in accordance with Section 01330: Submittals. Shop drawings shall include but are not limited to the following items:

1. Shop drawings showing unit dimensions and section details, locations and dimensions of wall penetrations, finishes, reinforcement, and connection details, lifting and erection inserts, all other embedded items, and layout diagrams identifying installation locations and number identification marks.
2. Plant Certification – Submit evidence of specified plant certification.
3. Installation Schedule – Accompany delivered units with a schedule indicating sequence of installation, joints, support, and bracing and attachment systems.
4. Test results of the concrete compressive strength.

B. Submit Product Data for waterproofing sealant in accordance with Section 01300: Submittals.

PART 2 - PRODUCTS

2.1 PRECAST CONCRETE MANHOLES

A. Precast concrete manhole shall be in general conformance with ASTM C478.

B. The bases and riser sections shall be manufactured as shown on the Drawings.

C. Holes shall be cast in the manholes at the elevations and sizes shown on the Drawings.

D. Manhole Steps

1. Manhole steps shall be ½-inch diameter Grade 60 steel encased in polypropylene, 12 inches wide, 12-inch step spacing, or approved equal.
2. Embedded Steps in manhole and vault shall be non-slip with a serrated surface.

2.2 PRECAST CONCRETE INLET STRUCTURE AND OUTLET STRUCTURE

A. Precast concrete inlet and outlet structures shall be manufactured as shown on the Drawings.

B. Concrete for the precast concrete inlet structure shall be in accordance with paragraph 2.1 of this Specification.

C. Holes shall be cast in the precast concrete inlet structure at the elevations and size shown on the Drawings.

2.3 GROUT

A. Grout placed around precast concrete structure penetrations shall be non-shrink grout that meets the requirements of Section 03605: Backfill Concrete and Grout.

2.4 JOINT SEALANTS

A. Joint sealers for the abutting precast concrete box culvert sections, manholes, or utility vaults shall be flexible joint sealant materials and in general conformance with ASTM C990.

B. Joint sealants shall be CONSEAL, RAMNEK, KOR-N-SEAL, or equivalent.

PART 3 - EXECUTION

3.1 FABRICATION

A. Do not fabricate precast concrete structures until intercept elevations for conduit penetrations are confirmed in the field.

3.2 GENERAL

A. The Contractor shall exercise care in the handling, storage, installation, and backfill of all precast concrete structures at the site. Precast concrete structures that are damaged during shipping, handling, storage, installation, backfilling, or work on adjacent structures will be subject to rejection by the Engineer. Rejected precast concrete structures shall be immediately removed from the site and replaced by the Contractor at no additional expense to the Owner.

B. The Contractor shall provide suitable equipment at the site for unloading and handling precast concrete structures at the site.

C. Inspect precast concrete manhole sections prior to assembly. Mark and remove from jobsite materials that are damaged or do not meet these Specifications.

D. Repair or replace all precast concrete structures damaged prior to Substantial Completion or during warrantee period.

3.3 DELIVERY, HANDLING, AND STORAGE

A. Lift and support units only at designated lifting and supporting points.

B. Transport units in a manner which will not result in overstressing or damage during delivery, handling, and storage of units.

C. Do not place units directly on earth.

D. Place stored units so that identification marks are discernible.

3.4 INSTALLATION

A. Precast concrete structures shall be installed to the elevations and locations shown on the Drawings. Elevations and locations of each structure shall be verified by the Contractor prior to delivering the units to the site.

B. Abutting precast concrete structures shall be joined using an approved joint sealant and in accordance with ASTM C990.

C. Grout shall be placed around each precast concrete structure that is in contact with other precast or cast-in-place to fill completely around the structure, such that it is watertight. Grout shall be placed in accordance with Section 03605: Backfill Concrete and Grout.

D. Foundations for precast concrete structures shall be in accordance with Section 02323: Earthwork.

E. Backfill around precast concrete structures shall be in accordance with Section 02323: Earthwork.

- END OF SECTION 03480 -

SECTION 03605
BACKFILL CONCRETE AND GROUT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Backfill concrete and non-shrink grout beneath concrete structures founded on sandstone subgrade, for installing instrumentation, conduit penetrations, miscellaneous metalwork, and other uses shown on the Drawings or as directed by the Engineer.

1.2 SUBMITTALS

A. Submit backfill concrete mix design in accordance with Section 01300: Submittals.

B. Submit manufacturer product data for non-shrink grout.

1.3 REFERENCES

A. ASTM C33 - Standard Specification for Concrete Aggregates

B. ASTM C94 - Standard Specification for Ready-Mixed Concrete

C. ASTM C150 - Standard Specification for Portland Cement

D. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete

E. ASTM C 309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete

F. ACI-304 - Guide for Measuring, Mixing, Transporting and Placing Concrete

G. ACI-308R - Guide to Curing Concrete

H. Where these Specifications differ from the requirements of ACI, the more stringent requirements shall apply.

PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS

A. CEMENT: ASTM C150 Type II, 564 pounds per cubic yard (minimum).

B. AGGREGATE: Concrete aggregate shall conform to ASTM C33. Coarse aggregate shall be size No. 57 (one inch (1.0”) nominal maximum size of coarse aggregate) or No. 67 (three-quarter inch (0.75”) nominal maximum size of coarse aggregate).

C. PROPORTIONING: Strength: Backfill concrete shall be normal weight concrete having a 28-day compressive strength of 4,000 psi, and a slump range from three inches (3”) to five inches (5”).

D. AIR ENTRAINMENT: Air entraining admixtures shall be used to entrain five to seven percent air by volume in all concrete. Air entrainment admixtures shall conform to ASTM C260.

E. FORM WORK: Earth cuts used as forms for vertical surfaces will be permitted where applicable. Exposed surfaces will be formed.

F. REINFORCEMENT: Reinforcing bars shall be new, deformed billet steel, ASTM A615, Grade 60. Minimum splice length for #4 bar shall be eighteen inches (18”).

G. CURING MATERIALS: Liquid-membrane forming curing materials shall conform to the requirements of ASTM C 309, Type 1, Class A or B.

2.2 BACKFILL CONCRETE MIX

A. Mix concrete in accordance with ASTM C94

B. Provide backfill concrete for required structures with the following characteristics:
   1. Minimum 28-day compressive strength: 4,000 pounds per square inch (psi).
   2. Slump: 4 inches plus/minus (+/- 1-inch)
   3. Maximum water-cement ratio: 0.42
   4. Air entrainment between 5% and 8%

2.3 NON-SHRINK GROUT

A. Non shrink grout: Proprietary, premixed nonferrous, non-shrink grout, minimum 5000 psi compressive strength at 28 days; Master Builder's Masterflow 713; Euclid Chemical Co. EucoNS; Five Star Grout; Burke Non-Ferrous Non Shrink Grout; or approved equal.

PART 3 - EXECUTION

3.1 PRODUCTION OF CONCRETE

A. Ready-mixed concrete shall be mixed and transported in accordance with ASTM C94

3.2 PLACING BACKFILL CONCRETE - GENERAL

A. Place backfill concrete as shown on the Drawings or as directed by the Engineer.

B. Concrete shall be placed against natural ground, Embankment Fill, or in forms, as required for the work. Concrete placing procedures shall conform to ACI-304 - Guide for Measuring, Mixing, Transporting and Placing Concrete

3.3 FINISHING BACKFILL CONCRETE

A. The finish requirements for the backfill concrete shall be a trowel finish.

3.4 PROTECTION AND CURING OF CONCRETE:

A. Protect finished work under provisions of ACI 301.

B. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical damage.

C. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

3.5 PLACING NON-SHRINK GROUT

A. Conform to the grout manufacturer's written instructions for physical or environmental limitations, and for mixing and placing.

B. Before placing non shrink grout, roughen concrete surfaces to which the grout will bond. Clean surfaces of all laitance, loose or defective concrete, coatings, and other foreign material by effective means, followed by thorough washing with water and saturate concrete surfaces with water for 24 hours. If any delay occurs between washing the concrete and placing the grout, lubricate the surfaces of the concrete with water immediately before placing grout.

C. Place non-shrink grout to obtain full and complete contact between concrete surfaces and the surfaces of base plates or other items shown to receive non shrink grout.

- END OF SECTION 03605 -

SECTION 05120
MISCELLANEOUS METALWORK

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Furnishing and installing materials, structural steel, miscellaneous metalwork, and embedded metalwork as shown on the Approved Construction Drawings or specified herein; including but not limited to the following:

1. Intake Structure Trash Rack
2. Combined Service Spillway Access Hatch
3. Manhole Steps

1.2 SUBMITTALS

A. General: Provide Miscellaneous Metalwork Submittal in accordance with Section 01300: Submittals and the requirements of this section. The Submittal shall include:

1. Submit shop drawings detailing fabrication and erection of each metal component shown on the Drawings or specified herein.
2. Include plans, elevations, sections and details of metal fabrications and their connections. Show anchorage and accessory items.
3. Indicate welded connections using standard AWS welding symbols. Clearly indicate net weld lengths, sizes and welding sequences.
4. Provide manufacturer's design and calculations for gratings and gratings with checkered plates, including load tables.
5. Provide manufacturer's data sheets, handling and installation instructions for concrete anchors.

1.3 QUALITY ASSURANCE

A. Each manufactured product shall meet, as a minimum, the requirements specified, and shall be a standard commercial product of a manufacturer regularly presently manufacturing items of type specified.

B. Each product type shall be the same and be made by the same manufacturer.

C. Assembled product to the greatest extent possible before delivery to the site.

D. Include additional features, which are not specifically prohibited by this specification, but which are a part of the manufacturer's standard.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Unless otherwise indicated on the Drawings, materials shall meet the requirements in the following paragraphs.

B. Structural Steel: ASTM A36.

C. Galvanized Coatings: ASTM A123

D. Square or Rectangular Hollow Structural Shapes (HSS): ASTM A500 Grade C with Fy = 50 ksi.

E. Steel pipe: ASTM A 53, Grade B

F. Stainless Steel: ASTM A240, Type 302 or 304.

G. Aluminum, Extruded: ASTM B221, Alloy 6063-T5 unless otherwise specified. For structural shapes use alloy 6061-T6 and alloy 6061-T4511.

H. Stainless Steel Tubing: ASTM A269, type 302 or 304.

2.2 HARDWARE

A. Rough Hardware:

1. Furnish rough hardware with a standard plating, applied after punching, forming and assembly of parts; galvanized, cadmium plated, or zinc-coated by electro-galvanizing process. Galvanized G-90 where specified.
2. Use G90 galvanized coating on ferrous metal for exterior work unless non-ferrous metal or stainless is used.

B. Fasteners:

1. Bolts with Nuts:
   a. ASME B18.2.2.
   b. ASTM A307 for 415 MPa (60,000 psi) tensile strength bolts.
   c. ASTM F468 for nonferrous bolts.
   d. ASTM F593 for stainless steel.

C. Screws: ASME B18.6.1.

D. Washers: ASTM F436, type to suit material and anchorage.

E. Nails: ASTM F1667, Type I, style 6 or 14 for finish work.

2.3 ANCHORS

A. Where indicated on the Drawings, drilled anchors shall be SS AISI 304 threaded rods secured in concrete with Hilti HIT-RE 500 V3 epoxy adhesive as manufactured by Hilti, or equal. Anchors shall have ICBO-approved testing. Embedment shall be as shown on the Drawings or enough to develop the yield strength of the anchor if no embedment depth is listed.

B. Wedge anchors indicated on the drawings shall be SS AISI 304 Strong Bolt 2 by Simpson Strong-Tie or equal. Anchors shall have ICBO-approved testing. Embedment shall be as shown on the Drawings or enough to develop the yield strength of the anchor if no embedment depth is listed.

C. Headed Anchor Studs: Headed anchor studs for embedded metalwork anchors shall be Nelson Stud Anchors or equal, and of the sizes shown on the Drawings.

2.4 PREFABRICATED ACCESS HATCHES

A. Prefabricated access hatches shall be of the sizes and types shown on the Drawings. A perimeter channel frame and drainage coupling shall be provided to drain water from the perimeter of the hatch. Door leaf(s) shall be minimum 1/4-in aluminum diamond pattern plate with sufficient stiffening to withstand a live load of 300 psf, unless otherwise noted on the Drawings. Provide spring operators for easy operation of doors. Doors shall open to 90 degrees with automatic door hold open and shall be provided with a griphandle to release the cover for closing. Hardware shall be durable and corrosion resistant with Type 316 stainless steel hardware used throughout. Provide removable lock handle and padlock hasp on the door. Embedded frame with embedment anchors shall be supplied by the hatch manufacturer. Factory finish shall be mill finish with bituminous coating to the exterior

of the frames. Manufacturer shall guarantee against defects in material or workmanship for a period of 10 years.

B. Prefabricated access hatches shall be: Halliday H1R, Bilco Type J, JD access hatch, or approved equal.

2.5 MANHOLE STEPS

A. Manhole steps shall be ½-inch diameter Grade 60 steel encased in polypropylene, 12 inches wide, 12-inch step spacing, or approved equal.

2.6 TRASH RACKS

A. Trash racks shall be constructed of galvanized steel as show on the Drawings.

PART 3 - EXECUTION

3.1 COORDINATION

A. Coordinate all structural steel and metalwork fabrication and erection with adjoining work for details of attachment, embedment, fittings, proper clearances, and avoidance of conflicts.

3.2 STORAGE OF MATERIALS

A. Store structural steel, metalwork, and related material, either plain or fabricated, above ground on platforms, skids, or other supports. Keep material free from dirt, grease, and other foreign matter and protect from corrosion.

3.3 FABRICATION, GENERAL

A. Except as otherwise specified, the fabrication and erection of structural steel and miscellaneous metalwork shall conform to the requirements of the AISC “Manual of Steel Construction” most recent edition.

B. Material:

1. Use material as specified. Use material of commercial quality and suitable for intended purpose for material that is not named or its standard of quality not specified.
2. Use material free of defects which could affect the appearance or service ability of the finished product.

C. Size:

1. Size and thickness of members as shown.
2. When size and thickness is not specified or shown for an individual part, use size and thickness not less than that used for the same component on similar standard commercial items or in accordance with established shop methods.

D. Connections:

1. Except as otherwise specified, connections may be made by welding, riveting or bolting.
2. Field riveting will not be approved.
3. Design size, number and placement of fasteners, to develop a joint strength of not less than the design value.
4. Holes, for rivets and bolts: Accurately punched or drilled and burrs removed.
5. Size and shape welds to develop the full design strength of the parts connected by welds and to transmit imposed stresses without permanent deformation or failure when subject to service loadings.

6. Use Rivets and bolts of material selected to prevent corrosion (electrolysis) at bimetallic contacts. Plated or coated material will not be approved.
7. Use stainless steel connectors for removable members machine screws or bolts.

E. Fasteners and Anchors:
1. Use methods for fastening or anchoring metal fabrications to building construction as shown or specified.
2. Where fasteners and anchors are not shown, design the type, size, location and spacing to resist the loads imposed without deformation of the members or causing failure of the anchor or fastener, and suit the sequence of installation.
3. Use material and finish of the fasteners compatible with the kinds of materials which are fastened together and their location in the finished work.
4. Fasteners for securing metal fabrications to new construction only, may be by use of threaded or wedge type inserts or by anchors for welding to the metal fabrication for installation before the concrete is placed or as masonry is laid.
5. Fasteners for securing metal fabrication to existing construction or new construction may be expansion bolts, toggle bolts, power actuated drive pins, welding, self-drilling and tapping screws or bolts.

F. Workmanship
1. General:
   a. Fabricate items to design shown.
   b. Furnish members in longest lengths commercially available within the limits shown and specified.
   c. Fabricate straight, true, free from warp and twist, and where applicable square and in same plane.
   d. Provide holes, sinkages and reinforcement shown and required for fasteners and anchorage items.
   e. Provide openings, cut-outs, and tapped holes for attachment and clearances required for work of other trades.
   f. Prepare members for the installation and fitting of hardware.
   g. Fabricate surfaces and edges free from sharp edges, burrs and projections which may cause injury.
2. Welding:
   a. Weld in accordance with AWS.
   b. All welding shall be by the shielded metal-arc method, the submerged-arc method, or the gas-shielded arc method, as described in the AWS “Welding Handbook”, and supplemented by other pertinent standards of the AWS. Qualifications of welders shall be in accordance with the AWS standards governing issue.
   c. In assembly and during welding, the component parts shall be adequately clamped, supported, and restrained to minimize distortion and for control of dimensions, Weld reinforcement shall be as

specified by the AWS code. Upon completion of welding, remove all weld splatter, flux, slag and burrs. Welds shall be repaired to produce a workmanlike appearance, with uniform weld contours and dimensions, All sharp corners of material to be painted or coated shall be ground to a minimum of 1/32-inch on the flat.

d. Welds shall show good fusion, be free from cracks and porosity and accomplish secure and rigid joints in proper alignment.

e. Where exposed in the finished work, continuous weld for the full length of the members joined and have depressed areas filled and protruding welds finished smooth and flush with adjacent surfaces.

f. Finish welded joints to match finish of adjacent surface.

3. Joining:

a. Miter or butt members at corners.

b. Where frames members are butted at corners, cut leg of frame member perpendicular to surface, as required for clearance.

4. Anchors:

a. Where metal fabrications are shown to be preset in concrete, weld 32 x 3 mm (1-1/4 by 1/8 inch) steel strap anchors, 150 mm (6 inches) long with 25 mm (one inch) hooked end, to back of member at 600 mm (2 feet) on center, unless otherwise shown.

5. Cutting and Fitting:

a. Accurately cut, machine and fit joints, corners, copes, and miters.

b. Fit removable members to be easily removed.

c. Design and construct field connections in the most practical place for appearance and ease of installation.

d. Fit pieces together as required.

e. Fabricate connections for ease of assembly and disassembly without use of special tools.

f. Joints firm when assembled.

g. Conceal joining, fitting and welding on exposed work as far as practical.

h. Do not show rivets and screws prominently on the exposed face.

i. The fit of components and the alignment of holes shall eliminate the need to modify component or to use exceptional force in the assembly of item and eliminate the need to use other than common tools.

G. Finish

1. Finish exposed surfaces in accordance with NAAMM AMP 500 Metal Finishes Manual.

2. Steel and Iron: NAAMM AMP 504.

a. Zinc coated (Galvanized): ASTM A123, G90 unless noted otherwise.

b. Surfaces exposed in the finished work:

(i) Finish smooth rough surfaces and remove projections.

(ii) Fill holes, dents and similar voids and depressions with epoxy type patching compound.

3. Shop Prime Painting:
    a. Surfaces of Ferrous metal:
        (i) All steel metalwork shall be galvanized unless noted otherwise.
    b. Nonferrous metals: Comply with MAAMM-500 series.

3.4 INSTALLATION, GENERAL

A. Set work accurately, in alignment and where shown, plumb, level, free of rack and twist, and set parallel or perpendicular as required to line and plane of surface.

B. Items set into concrete:
    1. Surfaces of embedded metalwork to be in contact with concrete shall be cleaned of all rust, dirt, grease, and other foreign substances before placing concrete.
    2. Set embedded metalwork accurately in position when concrete is placed and support it rigidly to prevent displacement or undue vibration during or after the placement of concrete.
    3. Place in accordance with setting drawings and instructions.

C. Field weld in accordance with AWS.
    1. Design and finish as specified for shop welding.
    2. Use continuous weld unless specified otherwise.

D. Install anchoring devices and fasteners as shown and as necessary for securing metal fabrications to structures as specified. Power actuated drive pins may be used except for removable items and where members would be deformed, or substrate damaged by their use.

E. Isolate aluminum from dissimilar metals and from contact with concrete materials as required to prevent electrolysis and corrosion.

- END OF SECTION 05120 -

SECTION 11285
OUTLET WORKS GATE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Furnishing and installing one (1) 12-inch-diameter slide gate as shown on the Drawings.

1.2 RESPONSIBILITIES

A. The slide gate manufacturer is responsible for the fabrication, shop testing, field testing, and delivery of the slide gate and accessories in accordance with this Specification and the applicable Drawings.

B. The Contractor is responsible for installing the slide gate and accessories in accordance with this Specification and the applicable Drawings. The Contractor shall be responsible for unloading and properly storing all gate components delivered by the gate manufacturer in accordance with these Specifications. The Contractor is responsible for repairing any damage to the slide gate and accessories that occurs during or after the unloading process at the Project Site. Repairs to the slide gate and accessories shall be completed by the Contractor to the Engineer's satisfaction and at no additional cost to the Owner.

1.3 DELIVERY SCHEDULE

A. The Slide Gate Submittal shall be provided to the Engineer by the slide gate manufacturer no later than 21 days prior to gate fabrication.

B. The slide gate and accessories shall be delivered to the Project Site as required by the Contractor.

1.4 SUBMITTALS

A. The slide gate submittal shall be submitted by the Contractor to the Engineer in accordance with Section 01300: Submittals. As a minimum, the slide gate submittal shall include:

1. Certificate of compliance with applicable ASTM, AWWA, ANSI or SAE standards.
2. Dimensional shop drawings for the gate and stem.
3. The material and coatings for each component of the gate and operator.
4. Manufacturer's catalog data and other literature for the gate, stem, and other appurtenances.
5. Design calculations for the slide gate, stem, and gate operator.
6. Manufacturer's installation instructions and connection details.
7. Manufacturer's operation and maintenance manuals for the slide gate and manual operator.
8. Details of insulated flanges and bolts to isolate dissimilar metals.
9. Stem guide dimensions, details, and installation instructions.

1.5 REFERENCES

A. AWWA C560 – Cast-Iron Slide Gates

B. ASTM A276 – Stainless Steel Bars and Shapes

C. ASTM B98 – Copper-Silicon Alloy Rod, Bar, and Shapes

D. ASTM B584 – Copper Alloy Sand Castings for General Applications
E. ASTM F593 – Stainless Steel Bolts, Hex Cap Screws, and Studs
F. ASTM F594 – Stainless Steel Nuts
G. ASTM D2000 – Standard Classification System for Rubber Products
H. ASTM A126 – Gray Iron Castings for Valves, Flanges, and Pipe Fittings
I. ASTM A-36 – Structural Steel
J. ASTM A-108 – Leaded Cold Rolled Steel
K. ASTM B-584 – Bronze (Lift Nut)

PART 2 - PRODUCTS

2.1 GENERAL

A. The outlet works gate shall be a 12-inch x 12-inch Hydro Gate Series HG560 or 12-inch-diameter Waterman C-20 Flatback Canal Gate or similar.
B. Gate shall be Self-Contained Sluice Gate with rising stem and manual operator.
C. The outlet works gate shall be designed for a minimum seating head of 15 feet and a minimum unseating head of 10 feet.
D. Reference the project Drawings and manufacturer instructions for mounting plan and dimension requirements.

2.2 SLIDE GATE MATERIALS

A. Materials of construction shall be as listed in AWWA C560 or ASTM A126.

2.3 SLIDE GATE FRAME AND GUIDES

A. The gate frames and guides shall be of one-piece construction.
B. Guide grooves shall be machined on all contact faces and shall be of such length as to support at least one-half (½) of the slide when it is in the full open position. Faces for mounting of wedging devices shall be fully machined.
C. Frames shall be flat-back for wall mounting as noted on the drawings.
D. Corrosion-resistant seating faces shall be mounted around the perimeter of the slide and frame. When the slide is in the fully closed position and wedged in position against the frame, maximum clearance between seating faces shall not exceed 0.004 inch.

2.4 SLIDE GATE WEDGES

A. The gate shall be provided with a sufficient number of wedges to provide a practical degree of water-tightness.
B. Wedges shall be fully adjustable and keyed to prevent any lateral rotation.
C. All contact faces of wedges and wedge blocks shall be precision-finished with 63 micro-inch finish or better.

2.5 STEMS

A. The gate shall be equipped with a rising stem, which will be connected by the gate manufacturer to the gate operator.
B. The gate stem shall be sized in accordance with the manufacturer's recommendations and shall be sized to withstand the axial compressive and tensile forces created during gate operation under the maximum unbalanced heads.
C. Stem splices shall be welded and pinned per manufacturer standard detail.

2.6 MANUAL OPERATOR

A. The slide gate shall be furnished with an enclosed geared pedestal lift manual operator. The lift shall be geared to a maximum of 25 foot-pounds of operator torque.

B. The manual operator shall include a clear plastic enclosure over the rising stem to show the gate position in increments of 1/4 inch. Provide vent holes to prevent condensation.

C. The manual operator shall be lockable.

2.7 PAINTING AND COATING

A. Painting and coating for all components shall be as recommended by the manufacturer. All painting and coating shall be shop applied with any areas damaged during shipment or handling to be repaired at the direction of the Engineer. Paint colors shall be the slide gate manufacturer's standard colors unless otherwise directed by the Engineer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The slide gate shall be installed and adjusted in a competent manner and in accordance with the gate manufacturer's instructions and recommendations.

B. The gate manufacturer shall furnish necessary drawings and detailed installation, operation, and maintenance instructions for all components.

C. The Contractor shall provide the manufacturer's recommended lubricants.

D. Installation of the gate shall follow the overall construction sequence for the outlet works.

3.2 FIELD TESTING

A. Prior to acceptance by the Engineer, the Contractor shall operate the slide gate through five (5) complete cycles. Any adjustments or corrections shall be made until the slide gate operates properly.

B. Field gate testing shall be witnessed by the Engineer.

- END OF SECTION 11285 -

SECTION 13100
DAM INSTRUMENTATION

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Furnishing and installing reservoir staff gage

1.2 SUBMITTALS

A. Submit survey data and product data of the reservoir staff gage

PART 2 - PRODUCTS

2.1 RESERVOIR STAFF GAGE

A. Reservoir staff gage shall be Leopold-Stevens staff gage, style C, or approved equal. The Engineer will provide numbering sequence upon submittal review.

B. Mounting bolts shall be stainless steel drilled and epoxy grouted in the concrete, and the size and length shall be as recommended by the staff gage manufacturer, or otherwise as shown on the Drawings.

PART 3 - EXECUTION

3.1 INSTALLING RESERVOIR STAFF GAGE

A. Install reservoir staff gage vertically in the combined service spillway vault as shown on the Drawings.

B. Staff gage markings shall be surveyed to match the locations shown on the Drawings.

C. Survey verification of staff gauge is required.

- END OF SECTION 13100 -

SECTION 13200
DRY HYDRANT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Furnishing and installing the reservoir Dry Hydrant as shown on the Approved Construction Drawings

1.2 REFERENCES

A. ASTM D1785-21a – Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.

B. AWWA M23 – PVC Pipe – Design and Installation

C. NFPA 1142 – Standard on Water Supplies for Suburban and Rural Firefighting, Chapter 8 – Dry Hydrants

D. NFPA 1960 – Standard for Fire Hose Connections, Spray Nozzles, Manufacturer's Design of Fire Department Ground Ladders, Fire Hose, and Powered Rescue Tools.

E. NRCS 432 – Conservation Practice Standard, Dry Hydrants

1.3 SUBMITTALS

A. Submit product information for all dry hydrant appurtenances, including piping, freeze protection, vehicle protection, and fittings.

B. Submit dry hydrant layout plan for approval by the Engineer. The layout plan shall show the pipe alignment, number of bends, fittings, and location of vehicle protection bollards.

PART 2 - PRODUCTS

2.1 DRY HYDRANT PVC PIPE

A. All dry hydrant piping shall be a minimum of 6-inch-diameter, Schedule 80, flush-joint PVC pipe or better and appropriate for pressurized water applications.

2.2 FREEZE PROTECTION

A. Freeze protection shall be provided in accordance with NFPA 1142. Freeze protection shall consist at a minimum of a 2-inch thick Styrofoam collar surrounding the riser, which in turn is surrounded by a PVC pipe of diameter 4 inches bigger than the riser pipe. A cap at the top of the freeze protection assembly must be installed and sealed to protect the insulation material.

2.3 VEHICLE PROTECTION

A. Vehicle protection bollards shall constructed as shown on the Drawings.

B. Backfill concrete shall be in accordance with Section 03605: Backfill Concrete and Grout of these Specifications.

C. Steel Pipe shall be in accordance with Section 05120: Miscellaneous Metals of these Specifications.

2.4 DRY HYDRANT SUCTION HOSE CONNECTION

A. Suction hose connections shall be compatible with the fire department's hard suction hose size and shall conform to NFPA 1960.

B. Suction hose shall be a 6-inch-diameter NHT/NST, and shall be a male connection with a threaded female cap. Fittings shall be aluminum, brass, or equivalent material as approved by the Engineer.

2.5 DRY HYDRANT STRAINER & STRAINER SUPPORT

A. Strainer may be commercially purchased, or fabricated by the Contractor, and shall meet the following conditions:
   1. The total area of holes in the strainer shall be a minimum of 30 square inches.
   2. The holes shall be no smaller than ¼-inch in diameter and no larger than ½-inch in diameter and shall be spaced a minimum of one diameter spacing apart from nearest hole.
   3. All holes shall be deburred.
   4. Holes shall be placed on no more than 2/3 of the circumference of the pipe.
   5. A 1-inch rib shall be left at the bottom of the strainer.
   6. The end of the strainer shall have a spring-loaded flap to allow for backflushing of the piping as part of the routine maintenance. All metal components of the strainer need to be of a non-corrosive material.

B. A minimum of one support structure must be used between the end of the strainer and where the pipe enters the soil. The number of strainers is subject to approval by the Engineer.

PART 3 - EXECUTION

3.1 GENERAL

A. Do not install dry hydrant piping until the excavation and the materials under the pipe are properly dewatered, in accordance with Section 02140: Dewatering and compacted in accordance with Section 02323: Earthwork.

B. The dry hydrant shall be located in an area with a minimum of 3 feet of clear, unobstructed space around it.

C. No more than 1 foot horizontal of pipe may be exposed without providing a support structure or mounding of fill material. No more than 2 vertical feet may extend out of the ground without providing additional support by means of a reinforcement collar or additional mounding of fill material. No more than 3 feet of pipe may be exposed out of the ground without providing additional support.

D. There shall be not less than 2 feet of water above the strainer and not less than 1 foot of water below the strainer.

3.2 DRY HYDRANT INSTALLATION

A. Handling and Storage: Contractor shall exercise care in the handling, storage, installation, and backfill of all pipe at the site. Pipe that is damaged during shipping, handling, storage, installation, backfilling, or work on adjacent structures will be subject to rejection by the Engineer. Rejected pipe shall be immediately removed from the site and replaced by the Contractor at no additional expense to the Owner.

B. Repair or replace all pipe damaged prior to Substantial Completion or during warrantee period.

C. Inspect each pipe and fitting prior to installation to ensure that no damaged portions of pipe are installed.

D. Before placement of pipe in the trench, thoroughly clean each pipe or fitting of any foreign substance that may have collected therein and keep the pipe clean at all times thereafter. For this purpose, close the openings of all pipes and fittings in the trench during any interruption to the work.

E. Pipe Laying: Install the pipe in accordance with AWWA M23.

F. Pipe Cleanup: As pipe laying progresses, keep the pipe interior free of all debris. Completely clean the interior of the pipe of all sand, dirt, mortar splatter and any other debris following completion of pipe laying, pointing of joints, and any necessary interior repairs per AWWA M23 prior to testing the completed piping.

G. A minimum number of elbows shall be used in the piping system.

H. Dry hydrant system piping shall be supported as shown on the Drawings. Stabilization shall be employed at elbows, joints, and other system stress points.

I. The top of the threaded dry hydrant connection will be no more than 30 inches from the ground surface and no less than 24 inches from the ground surface.

3.3 FREEZE PROTECTION

A. Freeze protection shall extend the entire length of the riser section of pipe to a depth of 4 feet below ground.

3.4 VEHICLE PROTECTION

A. Vehicle protection shall be spaced between the drivable surface and the connection at approximately two feet from the plane of the face of the connection to the vehicle protection and spaced three feet clear space either side of the centerline of the connection, as shown on the Drawings.

B. Steel pipe vehicle protection bollards shall be buried three feet below the ground and have 3 feet exposed above the surface. A one-foot-diameter base should be poured in backfill concrete at the bottom most portion of the pole, extending for the first two feet of the pole, as shown on the Drawings.

- END OF SECTION 13200 -