NOTICE AND CALL FOR BIDS

Apache Junction Sewer District, (the "District") will receive Bids for the Construction of the following Project:

PROJECT 25.08
Construction of Recharge Basin No.12

The bids will be used by the District to award a Contract for the construction of the Work which consists in part of the following:

In efforts to expand District treated effluent recharge area, mitigating groundwater declines Apache Sewer District is requesting bids for the construction of Recharge Basin [12], accompanying access roads, and the roads surrounding the basin. Only the civil work required for the construction of the project shall be included in this bid; no piping, valves or miscellaneous appurtenances will be included in this phase of the project. Removed soil will be stockpiled onsite at location indicated in this document.

This project will be partially funded by an awarded grant issued by the American Rescue Plan Act (ARPA) and contributed by the Water Infrastructure Finance Authority (WIFA) and is subject to federal regulations detailed in the WIFA Federal Provisions indicated in this document.

Further details can be found on the District website by visiting www.ajsewer.org.

Bids will be received until 10:00 am local time on Tuesday, November 12, 2024 at the District office, 5661 S. Ironwood Dr., Building A, Apache Junction, Arizona 85120, or mailed to the same address. It is the responsibility of the Bidder to ensure delivery of the bid. Late bids will not be considered. Any late bid received will remain the property of the District. Bids will be opened at the District office and publicly read aloud immediately after the hour of closing.

For a bid to be considered, Bidders must complete all required documents. Instructions to Bidders, Proposal forms, Project drawings and specifications, the Construction Contract, and any other supporting documents may be obtained at the District's website, www.ajsewer.org, or the District's office, Building A, between 7:00 am and 4:00 pm, Monday through Friday. All information and bids submitted by Bidders will be made available for public inspection at the District's office following the award of the Contract.

It shall be mandatory on the Contractor to whom the Contract is awarded, and upon any Subcontractor under them, to comply in every respect with the applicable provisions of the Arizona Revised Statutes and with all other requirements of, the laws of Arizona and the City of Apache Junction applicable to contracts for the construction of public works.

The District reserves the right to reject any or all Proposals and waive any irregularities in any Proposal if such action is determined by the District, in its sole discretion, to be in the interest of the District.

Apache Junction Sewer District is an equal-opportunity employer and minority, and women's business enterprises are encouraged to submit bids on this Project.

Apache Junction Sewer District

DATED: **October 10, 2024**

By: _____

Darron Anglin, District Manager

APACHE JUNCTION SEWER DISTRICT
RECLAIMING WATER FOR THE FUTURE

5661 South Ironwood Drive | Apache Junction, Arizona 85120
(480) 941-6754 | Fax (480) 671-3180 | www.ajsewer.org

BID PACKAGE

PROJECT 25.08

Construction of Recharge Basin No.12

(Recharge Bed Expansion – Phase 1)

Issue Date: October 10, 2024

Bids for this Project are due by:

Tuesday, November 12, 2024 at 10:00 AM

The prospective Bidder may obtain a copy of the District's Standard Specifications of Construction

Apache Junction Sewer District
5661 S. Ironwood Dr.
Apache Junction, AZ 85120
(480) 941-6767

INSTRUCTIONS TO BIDDERS

PROJECT 25.08
Construction of Recharge Basin No.12

1. **Definitions**
2. **Project Description**
3. **Examination of Bid Documents**
4. **Qualification of Bidders**
5. **Disqualification of Bidders**
6. **Preparation of Bid Proposals**
7. **Disclosure Requirement**
8. **Submission of Bid Proposal**
9. **Consideration of Bid Proposals**
10. **Award of Contract**
11. **Notice to Proceed**
12. **Bonds**
13. **Certificates of Insurance**
14. **Permits, Fees, and Licenses**
15. **Interpretation of Documents**
16. **Completion Date**
17. **Liquidated Damages**
18. **Subcontractors**
19. **Pre-Bid Construction Meeting**
20. **Guarantees**
21. **Prevailing Wage**
22. **Utility Locations**
23. **Acceptance of Project**
24. **Payment**
25. **Safety**
26. **City Sales Tax**
27. **Construction Staking**
28. **Exhibits**

FORMS:
BID UNDERSTANDING & AGREEMENT
COST PROPOSAL
EXCEPTIONS - ADDITIONS - CORRECTIONS
LIST OF SUBCONTRACTORS
WIFA AFFIRMATIONS
CERTIFICATE OF INSURANCE
STATUTORY PERFORMANCE BOND
STATUTORY PAYMENT BOND

Apache Junction Sewer District

INSTRUCTIONS TO BIDDERS

PROJECT 25.08
Construction of Recharge Basin No.12

To be considered, Bids must be made in accord with these Instructions to Bidders.

1. DEFINITIONS

A. BIDDER
Bidder shall mean any person, corporation or other entity who submits a bid proposal to the Apache Junction Sewer District pursuant to these documents.

B. SUCCESSFUL BIDDER
Successful Bidder shall mean the person or entity who submits a bid which the District determines is the lowest qualified Bidder and/or the best qualified Bidder and to whom the District awards the bid.

C. CONTRACTOR
A Contractor shall mean an individual, corporation or other entity to which the contract is awarded to do the work as specified in the contract documents.

D. DISTRICT
The District means the Apache Junction Sewer District.

E. WORK
Any or all of the improvements or construction services mentioned and authorized to be made and all expenses, labor, materials, permits, equipment, utilities, transportation, and management necessary or incidental thereto.

2. PROJECT DESCRIPTION

Work to be done under the contract consists of providing each and every item of expense necessary for providing construction services, which includes:

The construction of Recharge Basin [12], accompanying access roads, and the roads surrounding the basin. Only the civil work required for the construction of the project shall be included in this bid; no piping, valves or miscellaneous appurtenances will be included in this phase of the project. Details can be found in **Exhibit A** Project Drawings and **Exhibit B** Technical Specifications by designer Valentine Environmental Engineers. Removed soil will be stockpiled onsite at location defined in **Exhibit C**, also providing location of hydrant.

This project will be partially funded by an awarded grant issued by the American Rescue Plan Act (ARPA) and contributed by the Water Infrastructure Finance Authority (WIFA) and is subject to federal regulations as outlined in **Exhibit D** WIFA Federal Provisions.
All work shall be subject to the Technical Specification as found in **Exhibit B**.

3. EXAMINATION OF BID DOCUMENTS

The Bidder shall carefully examine and study the bid documents, including but not limited to the specifications and drawings necessary to receive the award of the Construction Contract, and is encouraged to visit the site of work to fully inform themselves as to all existing conditions and limitations. The submission of a proposal shall be evidence that the Bidder has made a thorough examination of the project and documents, and unless any exceptions, additions or corrections are noted in writing on the document Exceptions-Additions-Corrections, intends to supply each and every item of expense necessary for providing the total construction services of the project, including, but not limited to, permits, labor, materials, equipment, transportation, utilities, project coordination, oversight, management and other incidentals.

4. QUALIFICATION OF BIDDERS

Each Bidder shall be licensed to do business as a contractor in the State of Arizona and shall provide a copy of their license attached with the bid form. The successful Bidder must also be licensed in the City of Apache Junction. Each Bidder shall have sufficient personnel to undertake the work, including personnel with sufficient experience and formal training to meet the OSHA definition of a Competent Person for the work to be performed. Each Bidder shall also have sufficient equipment to provide the service required by the District, and shall have a history of providing satisfactory performance for their previous customers. The District may conduct any investigation it deems necessary to determine the Bidder's performance capabilities.

5. DISQUALIFICATION OF BIDDERS

The District shall have the right to reject any or all bids, before or after opening, and to reject bids not accompanied by attachments or in any way incomplete or irregular. As examples, any one of the following is sufficient grounds for the disqualification of a Bidder and rejection of its bid:

A. Submission of more than one proposal for the same materials or equipment from an individual, firm, partnership or corporation under the same or different names.

B. Evidence of collusion among Bidders.

C. Failure to fully complete all parts of the bid proposal or failure to submit the proposal in accordance with the requirements of the Bid Documents.

D. Failure to meet the qualifications for bidding or provide evidence of such qualifications when requested.

6. PREPARATION OF BID PROPOSAL

All information requested on the bid proposal must be completed by the Bidder. The information must be typed or printed in ink and all numbers must be legible. The Bidder must sign the proposal correctly in ink at the space provided.

7. DISCLOSURE REQUIREMENT

The Bidder must disclose as part of its bid any personal relationship it has or has had with employees, agents and other persons directly associated with the District prior to or as part of this bid. Any such disclosure shall be noted in writing on the document Exceptions-Additions-Corrections. Any such disclosure does not necessarily disqualify the Bidder.

8. SUBMISSION OF BID PROPOSAL

The bid proposal together with required documents shall be submitted to the District in opaque, sealed envelopes bearing on the outside the Bidder's name and address and the Project name as denoted on the Notice and Call for Bids.

Bid proposals sent by mail shall be enclosed in a separate mailing envelope and shall be addressed to the District office. Bid proposals should be sent by registered mail, but failure to do so shall not disqualify a bid. No proposal will be considered unless received on or before the time and the place designated in the Notice and Call for Bids.

The bid proposal delivered to the District MUST contain the following in the envelope:

BID UNDERSTANDING & AGREEMENT
COST PROPOSAL
EXCEPTIONS - ADDITIONS - CORRECTIONS
LIST OF SUBCONTRACTORS
COPY OF ARIZONA BUSINESS LICENSE
WIFA AFFIRMATIONS

If awarded the bid, the Bidder must present the following completed forms at the time of the signing of the Construction Contract:

CERTIFICATE OF INSURANCE
STATUTORY PERFORMANCE BOND
STATUTORY PAYMENT BOND
FORM W-9

9. CONSIDERATION OF BID PROPOSALS

Bids will be publicly opened and read aloud. The Bid shall be the correct summation of the items shown on the Cost Proposal. The contract for this project may be awarded to the qualified and responsible bidder whose proposal is satisfactory to the District. The District reserves the right to waive technicalities or informalities; to reject any or all proposals; and to accept the proposal deemed to be in the best interest of the District.

Notwithstanding anything to the contrary contained herein, the District may reject the lowest bid in its sole and absolute discretion.

10. AWARD OF CONTRACT

If a contract is awarded, it will be awarded by the District on November 13, 2024. Notice to the Successful Bidder shall be reported to all Bidders. Nothing herein shall be construed to require the District to award a contract. All bids may be rejected.

11. NOTICE TO PROCEED

The notice to the Successful Bidder shall serve as the District's acceptance of the proposal. Notice to Proceed with ordering the materials or equipment and scheduling work shall be obtained from the District in writing upon execution of the Construction Contract.

12. BONDS

Contractor shall obtain and submit to District before any Work is performed:

A. **Performance Bond**

The Contractor will be required to furnish non-revocable security binding the Contractor to provide faithful performance of the contract in the amount of 100% of the total Contract price payable to the District.

a. Performance security will be in the form of a performance bond, certified check or cashier's check. If the contractor fails to execute the security document as required, the contractor may be found in default and the Contract may be terminated by the District. In case of default the District reserves all rights.

b. All performance bonds must be executed on forms in this bid and incorporated by this reference. All performance bonds duly executed by the Bidder as Principal and having as Surety thereon a Surety Company holding a Certificate of Authority to transact surety business in the State of Arizona, by the Arizona Department of Insurance. Individual sureties are unacceptable. All Insurers and Sureties will have at the time of submission of the proposal and AM Best rating of "A-" or better**.**

B. Payment Bond

The Contractor will be required to furnish non-revocable security for the protection of all persons supplying labor and material to the contractor or any subcontractor for the performance of any work related to the Contract. Payment security will be in the amount of 100% of the total Contract price and be payable to the District.

a. Payment security will be in the form of a payment bond, certified check or cashier's check.

b. All payment bonds will be executed on forms included in the Bid Document, duly executed by the Bidder as Principal and having as Surety thereon a Surety company holding a Certificate of Authority to transact surety business in the State of Arizona, by the Arizona Department of Insurance. Individual sureties are unacceptable. All Insurers and Sureties will have at the time of submission of the proposal and A.M. Best's Key Rating Guide of "A-" or better as currently listed in the most recent Best

Key Guide, published by the A.M. Best Company, payable without condition to the District.

13. CERTIFICATES OF INSURANCE

Contractor shall obtain and submit to District before any Work is performed, certificates from the Contractor's insurance carriers indicating the presence of coverages and limits of liability as set forth in the Contract documents, but in no event shall the coverages and limits be less than those specified as follows:

A. **Workers' Compensation**

Coverage A. Statutory Benefits.
Coverage B. Employer's Liability.

Bodily Injury by accident	$1,000,000 each accident
Bodily Injury by disease	$1,000,000 policy limit
Bodily Injury by disease	$1,000,000 each employee

Coverage must include a Waiver of Subrogation endorsement.

B. **Commercial Auto Coverage**

Auto Liability limits of not less than $1,000,000 each accident, combined Bodily Injury and Property Damage Liability insurance. Certificate to reflect coverage for "Any Auto" (Symbol 1) or "All Owned, Scheduled, Hired and Non-Owned" (Symbols 7, 8, 9).

C. **Commercial General Liability**

Each Occurrence Limit	$1,000,000
Personal Injury/Advertising Injury Limit	$1,000,000
Products/Completed Operations Aggregate Limit	$2,000,000
General Aggregate Limit (other than Products/Completed Operations)	$2,000,000

Coverage must include a Waiver of Subrogation endorsement.

Both policy forms must include:

a. Premises and Operations coverage with no explosion, collapse or underground damage (XCU) exclusions and no Subsidence Exclusion.

b. Products and Completed Operations coverage. Contractor agrees to maintain this coverage following completion of the Work and to continue to name the District as an Additional Insured for a period at least equal to the applicable statute of repose for latent defects.

c. Blanket contractual coverage for the indemnity/hold harmless agreements assumed in this the Contract.

d. Broad Form Property Damage coverage, including completed operations or its equivalent.

e. An endorsement naming the District, any other party required to be named as an additional insured under the Contract Documents, and any other parties in interest as Additional Insured(s) under the coverage specified under Comprehensive General Liability or Commercial General Liability. The endorsement shall be on ISO forms CG2010 10/01 and CG2037 10/01 or equivalent. Any form that does not grant additional insured status for both the ongoing operations and products/completed operations coverages IS NOT ACCEPTABLE.

f. An endorsement stating: "Such coverage as is afforded by this policy for the benefit of the additional insured(s) is primary and any other coverage maintained by such additional insured(s) shall be non-contributing with the coverage provided under this policy."

g. Coverage on an "Occurrence" form. "Claims Made" and "Modified Occurrence" forms are not acceptable.

h. Coverage to include general aggregate limits on a "per project" basis.

D. **Excess Liability**

Umbrella or Excess Liability of $5,000,000 to extend the above liability coverages and limits to reach a total combined limit of:

Each Occurrence	$6,000,000 (GL and Automobile)
Aggregate	$7,000,000 (GL)

E. **Other Requirements**

1) All policies must be written by insurance companies whose rating, in the most recent Best's Rating Guide, is not less than A- VII. All coverage forms must be acceptable to Owner.
2) Certificates of Insurance with the required endorsements evidencing the required coverages must be delivered to the District prior to commencement of any Work. Failure of the District to demand such certificate or other evidence of full compliance with these insurance requirements or failure of the District to identify a deficiency from evidence that is provided shall not be construed as a waiver of the Contractor's obligation to maintain such insurance. The District shall have the right, but not the obligation, to prohibit Contractor or any of its subcontractors from entering the Project site until such certificates or other evidence that insurance has been placed in complete compliance with these requirements is received and approved by the District.
3) The District reserves the right, in its sole discretion, to require higher limits of liability coverage if, in the District's opinion, operations by or on behalf of Contractor create higher than normal hazards and, to require Contractor to name additional parties in interest to be Additional Insureds.
4) In the event that rental of equipment is undertaken to complete and/or perform the Work, Contractor agrees that it shall be solely responsible for such rental equipment. Such responsibility shall include, but not be limited to, theft, fire, vandalism and use by unauthorized persons.
5) In the event that materials or any other type of personal property ("personal property") is acquired for the Project or delivered to the Project site, Contractor agrees that it shall

be solely responsible for such property until it becomes a fixture on the Project, or otherwise is installed and incorporated as a final part of the Project. Such responsibility shall include, but not be limited to, theft, fire, vandalism and use by unauthorized persons.

6) The District does not cover any tools or equipment owned or rented by Contractor including trailers, excavators, scaffoldings, or forms. Contractor is responsible for providing insurance coverage for such items.
7) If the Contract Documents provide for an Owner Controlled Insurance Program ("OCIP") which provides coverage for the Work, the Contractor shall comply with all provisions of any such OCIP.

14. PERMITS, FEES & LICENSES

Contractor shall secure and pay for all applicable Federal, State, County or local permits and licenses including a City Business License. All subcontractors shall be licensed to do business in the State of Arizona and the City of Apache Junction.

The Contractor shall comply with all applicable provisions of the Arizona Revised Statutes and Arizona Administrative Code Rules and all other applicable legal provisions as set forth in local and Federal laws, ordinances or rules.

15. INTERPRETATION OF DOCUMENTS

Where a plan, specification or document appears ambiguous, or where any portion is not fully understood, the Contractor shall submit his question by email to bids@ajsewer.org. The subject line of the email must reference the Project Number and Name as denoted on the Notice and Call for Bids. Verbal explanations shall not be binding.

16. COMPLETION DATE

Based on a Notice to Proceed date of November 13, 2024, this project must be completed by January 30, 2025.

17. LIQUIDATED DAMAGES

Time is of the essence in the Contract. Failure to complete the work by January 30, 2025, to the satisfaction of the District will cause a loss to the District. Bidder hereby acknowledges that such loss could cause District resulting damages. Consequently, liquidated damages per Maricopa Association of Governments (MAG) Uniform Standard Specifications and Details for Public Works Construction Table 108-1 will be deducted from the final payment for each calendar day the work is incomplete after January 30, 2025. Upon failure to complete the Work within the time specified, the District has the right to terminate the Contract and hire a new Contractor to complete the Work.

18. SUBCONTRACTORS

The Contractor must list the names, address and telephone number of any subcontracting firm retained for the project on the form provided in the Bid Proposal package. All Subcontractors must be licensed to do business in the State of Arizona and the City of Apache Junction.

19. PRE-BID CONSTRUCTION MEETING

No pre-bid construction meeting is required for this project. The District will allow for a 10:00 a.m. site visit on October 23, 2024 for interested bidders.

20. GUARANTEES

The Contractor shall warrant to the District that materials and equipment furnished under the Contract will be of good quality and new, and that the Work will be free from defects not inherent in the quality required or permitted, and that the Work will conform with the requirement of the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective.

The Contractor shall guarantee all labor and workmanship and any materials it installs for a period of one (1) year following the date of completion and acceptance by the District. The guarantee will not apply to normal wear and tear, and defects caused by abuse.

If any portion(s) of the Work or any of the materials become defective within the guarantee period, the District will notify the Contractor of the defect. The Contractor must repair the defect within fifteen (15) days of such notification. If repairs are not completed within this time period, the District may repair the defect, or cause the defect to be repaired, and the cost of the repairs shall be paid by the Contractor. The District reserves the right to determine which defects are the result of poor labor and workmanship and which are caused by defective materials. The guarantee period on any defect of the Work that is repaired or replaced shall be one (1) year following the date of the repair or replacement.

21. PREVAILING WAGE

The minimum rate of wage for all laborers and mechanics employed by the Contractor or any Subcontractor on the project shall be as required by State or Federal law.

22. UTILITY LOCATIONS

The Contractor is responsible for coordinating with private utilities and Blue Stake for utility locations.

23. ACCEPTANCE OF PROJECT

Upon notice that the Work is ready for final inspection or acceptance, the District's authorized representative shall promptly make an inspection. When the District's authorized representative finds the Work acceptable under the terms of the Contract Documents, the Contractor shall submit an invoice to the District for the balance due the Contractor.

24. PAYMENT

The Contract sum shall be the total amount payable by the District to the Contractor for the performance of the Work under the Contract Documents with the addition of changes authorized by properly executed Change Orders. Upon completion of the Work, the District will, after receipt of proper invoice, pay the amount due the Contractor. If the District believes that additional work such as clean-up is required, it may deduct the total cost of such additional work from the amount to be paid to the Contractor.

25. SAFETY

The Work is to be governed at all times by applicable provisions of both State and federal laws, which laws include, but are not limited to, the latest amendments to the following:

i. Federal Occupational Safety & Health Act of 1970 (P.L. Law 91-596).

ii. State of Arizona, Occupational Safety and Health Standards for General Industry, 29 CFR Part 1910.

iii. State of Arizona, OSHA Safety and Health Standards for the Construction Industry, 29 CFR Part 1926.

The Contractor shall provide all shoring, safety devices and protective equipment and take any other needed actions, on his own responsibility, as reasonably necessary to protect the life and the health of employees on the job, and the safety of the public. The Contractor shall provide and make available at the work site on a daily basis, an OSHA defined Competent Person for the work to be performed, that is capable of identifying existing and predictable hazards in the surroundings, or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

The Competent Person shall, on a daily basis, provide a safety inspection of the work site and quantify such inspections in a log, binder, or journal that shall be made available for District inspection.

The Contractor shall provide, erect, and maintain all necessary barricades, suitable and sufficient lights, danger signals, warning signs and other traffic control devices, and shall take all necessary precautions for the protection of the work and safety of the public in accordance with City of Apache Junction requirements.

26. CITY SALES TAX

The City of Apache Junction taxes gross income received by a construction contractor within the City. The prime Contractor is responsible for the reporting and payment of any and all taxes. For further information, contact the City's Business License Clerk, at (480) 474-5070.

Gross income derived by acting as a subcontractor shall be exempt. To qualify as a subcontractor, the prime construction contractor must provide the subcontractor with a written declaration that the prime contractor is liable for the tax on the project and provides the subcontractor both his Arizona Transaction Privilege License number and his City Privilege License number.

27. CONSTRUCTION STAKING

The Contractor will provide construction stakes for alignment and depth. Protection of all such points shall be the contractor's responsibility.

28. EXHIBITS

The following exhibits, with reference to the scope of work in which they are first referenced, are incorporated by this reference.

Exhibit A	Project Drawings
Exhibit B	Technical Specifications
Exhibit C	Dirt Stockpile & Hydrant Locations
Exhibit D	WIFA Federal Provisions

29. General Information

Debarment and SAM.GOV Certification. Contractor certifies with signed WIFA AFFIRMATIONS Form, issued with bid submittal that Contractor, any subcontractors, material supplier, or vendor used has not been debarred, suspended, declared ineligible, or voluntarily excluded from covered transactions by any federal or state department/agency as outlined in **Exhibit D** WIFA Federal Provisions.

Lobbying Certificate Disclosure. Per WIFA Federal Provisions 5.1. the following shall apply:
5.1.1. No Federal appropriated funds have been paid or will be paid, by or on behalf of the Grantee, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
5.1.2. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the Grantee shall complete and submit Standard Form-LLL, “Disclosure Form to Report Lobbying,” in accordance with its instructions.

Project 25.08
Construction of Recharge Basin No.12

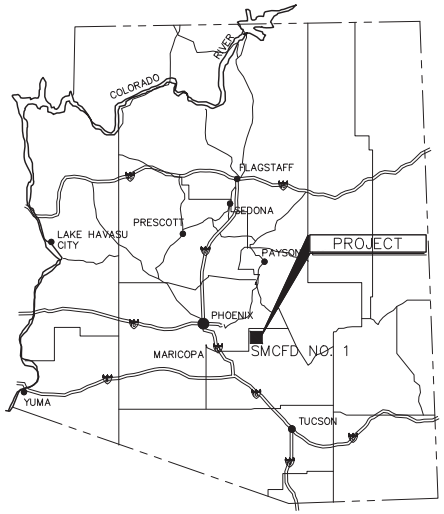
EXHIBIT A
Project Drawings

SUPERSTITION MOUNTAINS COMMUNITY FACILITIES DISTRICT (SMCFD)
RECHARGE FACILITIES IMPROVEMENTS
EARTHWORK

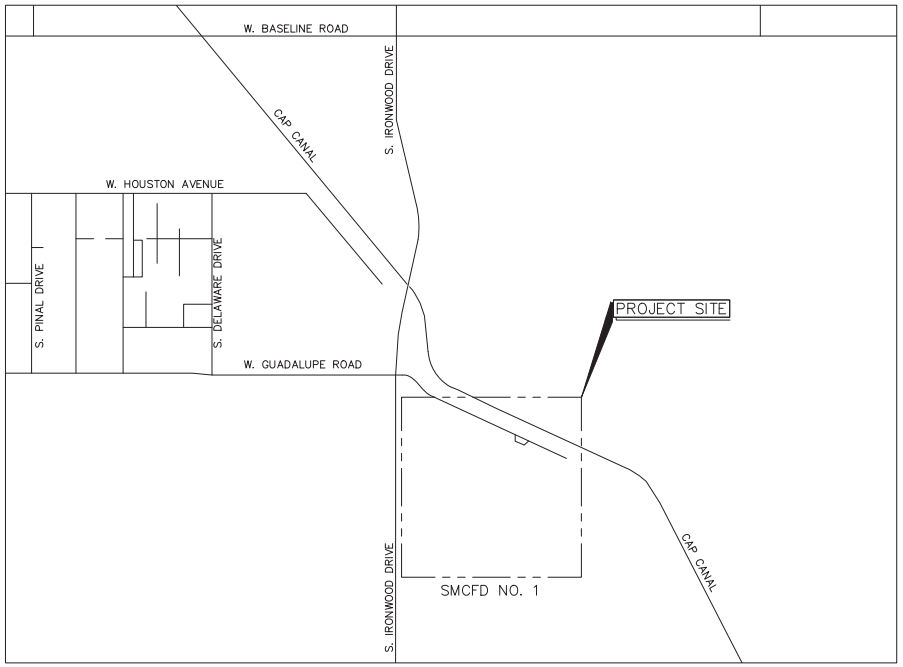
5661 SOUTH IRONWOOD DRIVE
APACHE JUNCTION, AZ 85120

OCTOBER 2018
VOLUME 1 OF 2

VALENTINE
Environmental Engineers, LLC
15845 South 46th Street, Suite 144 Phoenix, Arizona 85048
Phone: (480) 283 - 8991 Fax: (480) 283 - 0082



APACHE JUNCTION, ARIZONA
LOCATION MAP



VICINITY MAP
NOT TO SCALE

SHEET INDEX

BASIS OF BEARING
WGS84 GRID NORTH

BASIS OF COORDINATE SYSTEM
ARIZONA STATE PLANE COORDINATES (AT GROUND) WITH THE POINT OF ORIGIN AT
BASE PT. #50
N 859547.055 E 809201.010
ELEVATION 1564.38 NAVD88
LAT: 33°21'44.39139"
LONG: 111°33'32.40385" W

BENCHMARK
BRASS CAP MONUMENT IN NORTH FENCE LINE STAMPED "DOI STA 191+30.96"
ELEVATION 1563.90 NAVD 88 N 860258.420 E 808618.412

ALUMINUM 3" CAP MONUMENT IN NORTH FENCE LINE STAMPED "RLS 39325"
ELEVATION 1561.56 NAVD 88 N 860356.769 E 808402.668

RED CAP REBAR ON SITE NW CORNER OF ELECTRIC VAULT 53 FEET SE OF EASTERLY AERATION BASIN
ELEVATION 1562.54 NAVD 88 N 859358.433 E 809626.470

OWNER
SUPERSTITION MOUNTAINS COMMUNITY FACILITIES DISTRICT (SMCFD)
5661 S IRONWOOD DRIVE
APACHE JUNCTION, AZ 85120
PHONE: (480) 941-6760
FAX: (480) 671-3180
CONTACT: DARRON ANGLIN, PE

ENGINEER
VALENTINE ENVIRONMENTAL ENGINEERS
15845 SOUTH 46TH STREET, SUITE 144
PHOENIX, AZ. 85048
PHONE: (480) 283-8991
FAX: (480) 283-0082

REVIEWED BY:

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY DATE

SMCFD – NO. 1 RECHARGE FACILITIES IMPROVEMENTS – VOLUME 1 OF 2

CONSTRUCTION NOTES

1. ALL CONSTRUCTION IN THE PUBLIC RIGHTS-OF-WAY OR IN EASEMENTS GRANTED FOR PUBLIC USE MUST CONFORM TO THE LATEST MARICOPA ASSOCIATION OF GOVERNMENTS (MAG) UNIFORM STANDARD SPECIFICATIONS AND UNIFORM STANDARD DETAILS FOR PUBLIC WORKS CONSTRUCTION.

2. WHENEVER EXCAVATION IS TO BE DONE, CALL THE "BLUE STAKE CENTER", (602)263-1100, TWO WORKING DAYS BEFORE EXCAVATION IS TO BEGIN. THE CENTER WILL SEE THAT THE LOCATION OF THE UNDERGROUND UTILITY LINES IS IDENTIFIED FOR THE PROJECT. CALL "COLLECT" IF NECESSARY.

3. ENCROACHMENT PERMITS ARE REQUIRED FOR ALL WORK IN PUBLIC RIGHT-OF-WAY AND EASEMENTS GRANTED FOR PUBLIC PURPOSES. COPIES OF ALL PERMITS SHALL BE RETAINED ON SITE AND SHALL BE AVAILABLE FOR INSPECTION AT ALL TIMES. FAILURE TO PRODUCE THE REQUIRED PERMITS WILL RESULT IN IMMEDIATE WORK STOPPAGE UNTIL THE PROPER PERMIT DOCUMENTATION IS OBTAINED.

4. ALL EXCAVATION AND GRADING WHICH IS NOT IN THE PUBLIC RIGHTS-OF-WAY OR NOT IN EASEMENTS GRANTED FOR PUBLIC USE MUST CONFORM TO CHAPTER 33, EXCAVATION AND GRADING, OF THE LATEST EDITION OF THE UNIFORM BUILDING CODE PREPARED BY THE INTERNATIONAL CONFERENCE OF BUILDING OFFICIALS. A PERMIT FOR THIS GRADING MUST BE SECURED.

5. THE CONTRACTOR SHALL OBTAIN ANY PERMITS REQUIRED FOR THE WORK, UNLESS OTHERWISE INDICATED. CONTRACTOR SHALL REVIEW PERMIT REQUIREMENTS AND INCLUDE COSTS IN THE BID TO COMPLY WITH ALL PERMIT REQUIREMENTS, INCLUDING COORDINATION OF ALL RELOCATION AND REMOVALS BY OTHERS.

6. THE CONTRACTOR IS ADVISED THAT AN EXCAVATION AND DIRT MOVING PERMIT MAY BE REQUIRED BY THE TOWN OF TAYLOR. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO OBTAIN THIS PERMIT, IF NECESSARY, AND COMPLY WITH ITS REQUIREMENTS.

7. THE CONTRACTOR SHALL COORDINATE WORK SCHEDULES WITH THE OWNER'S REPRESENTATIVE SO AS TO PREVENT ANY CONFLICTING WORK CONDITIONS.

8. LOCATIONS, ELEVATIONS AND DIMENSIONS OF EXISTING UTILITIES, STRUCTURES AND OTHER FEATURES ARE SHOWN ACCORDING TO THE BEST INFORMATION AVAILABLE AT THE TIME OF THE PREPARATION OF THESE PLANS, BUT DO NOT PURPORT TO BE ABSOLUTELY CORRECT AND ARE APPROXIMATE. NEW(ER) UTILITIES MAY EXIST. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING LOCATIONS, ELEVATIONS AND DIMENSIONS OF ALL EXISTING AND NEW(ER) UTILITIES, STRUCTURES AND OTHER FEATURES AFFECTING THIS WORK AND AVOIDING DAMAGE TO SAME.

9. THE CONTRACTOR SHALL CONTACT THE UTILITY PRIOR TO PROCEEDING WITH WORK WHICH INVOLVES OR AFFECTS EXISTING FEATURES OR AFFECTS EXISTING UTILITIES.

10. ALL UTILITIES SHALL BE PROTECTED FROM DAMAGE AS A RESULT OF THE WORK AND CONTRACTOR CREW ACTIVITIES. THE CONTRACTOR SHALL RELOCATE, REPAIR OR REPLACE ANY UTILITIES TO THE SATISFACTION OF THE UTILITIES AND THE OWNER. THE CONTRACTOR SHALL ASSUME FULL RESPONSIBILITY FOR ANY DAMAGE TO EXISTING FACILITIES RESULTING FROM THE PERFORMANCE OF THE WORK. REPAIR AND REPLACEMENT OF DAMAGED FACILITIES SHALL BE PERFORMED IN A TIMELY MANNER AT NO ADDITIONAL COST TO THE OWNER.

11. PROVIDE THRUST RESTRAINT FOR EXISTING PIPING WHENEVER THE WORK REQUIRES. CONTRACTOR TO REPLACE OR RESTORE THE EXISTING RESTRAINT SYSTEM TO LIKE NEW CONDITION. RESTRAINT SYSTEMS FOR EXISTING DUCTILE IRON PIPE SHALL BE MECHANICAL JOINT RESTRAINT ONLY. NO THRUST BLOCKS ARE PERMITTED FOR EXISTING DUTILE IRON PIPES. RESTRAINT JOINTS FOR EXISTING DUCTILE IRON PIPE SHALL BE IN ACCORDANCE WITH SECTION 750.3 OF THE MAG SPECIFICATIONS AND MAG STD DETAILS 302-1 AND 302-2. DUCTILE IRON PIPING SYSTEMS TO BE RESTRAINED THE COMPLETE LENGTH OF THE PIPELINE SYSTEM.

12. (*) INDICATES DIMENSIONS, DISTANCES, COORDINATES OR ELEVATIONS TO BE SURVEYED AND FIELD VERIFIED BY THE CONTRACTOR PRIOR TO INITIATING ANY OF THE WORK.

13. (**) INDICATES DIMENSIONS OR ELEVATIONS TO BE DETERMINED BASED UPON EQUIPMENT MANUFACTURER SELECTED.

14. EXISTING BURIED PIPING, ELECTRICAL DUCT BANKS AND OTHER BURIED UTILITIES ARE SHOWN IN THEIR APPROXIMATE LOCATIONS AND MAY VARY FROM THAT WHICH HAS BEEN SHOWN WITHIN THIS SET OF DRAWINGS. CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING EXACT LOCATION, ORIENTATION, AND SIZE OF SUCH UTILITIES. CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING AND EXPOSING BURIED PIPE, ELECTRICAL DUCT BANK AND OTHER UTILITIES THAT MAY EFFECT WORK AREAS PRIOR TO COMMENCING WORK. THIS IS NOT CONSIDERED POTHOLING, POTHOLING SHALL BE DIRECTED BY THE OWNER.

15. IN THE EVENT THAT HISTORIC OR PREHISTORIC SURFACE OR SUBSURFACE CULTURAL FEATURES OR DEPOSITS ARE ENCOUNTERED DURING PROJECT ACTIVITIES, THESE ACTIVITIES MUST BE DISCONTINUED IN THE IMMEDIATE AREA WHERE THE CULTURAL RESOURCES ARE DISCOVERED, AND AN ARCHAEOLOGIST CONSULTED TO EVALUATE THE NATURE AND SIGNIFICANCE OF THE MATERIALS.

16. CONTRACTOR SHALL KEEP ALL CONSTRUCTION EQUIPMENT AT LEAST 50' FROM EXISTING OVERHEAD POWER LINES. IF THIS IS NOT FEASIBLE, CONTACT THE UTILITY OWNER TO INSTALL A TEMPORARY PROTECTIVE COVERING ON THE POWER LINES.

17. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO PROVIDE ALL NECESSARY FITTINGS AND ADAPTERS REQUIRED TO CONNECT DIFFERENT TYPES OF PIPE LINE MATERIAL.

18. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK AND SHALL IMMEDIATELY NOTIFY THE OWNER OF ANY DISCREPANCIES.

19. UNLESS DETAILED, SPECIFIED OR INDICATED OTHERWISE, CONSTRUCTION SHALL BE AS INDICATED IN THE APPLICABLE TYPICAL DETAILS AND GENERAL NOTES. TYPICAL DETAILS ARE MEANT TO APPLY EVEN THOUGH NOT REFERENCED AT SPECIFIC LOCATIONS OR IN SPECIFIC DRAWINGS.

20. GOVERNING BUILDING CODES
ALL CONSTRUCTION SHALL COMPLY WITH THE FOLLOWING CODES AND AMENDMENTS PER THEIR ADOPTING ORDINANCES:
2012 INTERNATIONAL BUILDING CODE (IBC)
2012 INTERNATIONAL MECHANICAL CODE (IMC)
2012 INTERNATIONAL FIRE CODE (IFC)
2012 INTERNATIONAL ENERGY CONSERVATION CODE (IECC)
2012 INTERNATIONAL PLUMBING CODE (IPC)
2011 NATIONAL ELECTRIC CODE (NEC)

21. IN ACCORDANCE WITH AAC R18-4-119, ALL MATERIALS WHICH MAY COME INTO CONTACT WITH DRINKING WATER SHALL CONFORM TO NATIONAL SANITATION FOUNDATION STANDARD 60 AND 61.

22. ALL OFFSITE CONSTRUCTION ACTIVITIES SHALL BE CONTAINED WITHIN THE PUBLIC RIGHT OF WAY OR IN EASEMENTS GRANTED FOR THE WORK. ONSITE CONSTRUCTION ACTIVITIES SHALL BE WITHIN DELINEATED WORK AREA BOUNDARIES.

23. THE SEPARATION OF WATER AND SEWER MAINS SHALL CONFORM TO REQUIREMENTS OF MAG STANDARD DETAIL 404, MARICOPA COUNTY BULLETIN NO. 10 AND ADEQ RULES, WHICHEVER IS GREATER.

24. NOT USED.

25. NOT USED.

26. WHERE NEW WORK AND EXISTING FEATURES ARE DEPICTED ON THE SAME SHEETS, EXISTING FEATURES ARE SHOWN WITH LIGHTER, SCREENED, LINES.

27. REPAIR AND REPLACEMENT WORK ON EXISTING UTILITIES, INCLUDING OVERHEAD POWER LINES AND POLES, SHALL BE PERFORMED BY THE CONTRACTOR, WITH PERMISSION GRANTED BY THE UTILITY OWNER. ALL COSTS ASSOCIATED WITH REPAIR AND/OR EXISTING UTILITIES DUE TO CONTRACTOR'S WORK SHALL BE THE CONTRACTOR'S RESPONSIBILITY.

28. ALL GROUND WATER PUMPED FROM EXCAVATION AREAS SHALL BE DISCHARGED PER PERMIT INTO APPROVED EROSION CONTROL FACILITIES AND DRAINAGE COURSES.

29. CONTRACTOR SHALL PREPARE AND FURNISH TO THE OWNER A SET OF AS-BUILT DRAWINGS AT THE COMPLETION OF THE PROJECT. AS-BUILT DRAWINGS SHALL SHOW THE CORRECT AND ACTUAL, INSTALLED LOCATION OF THE PIPELINE AND APPURTENANCES. SEE SPECIFICATIONS FOR REQUIREMENTS.

30. ALL CROSSED UTILITIES SHALL BE SUPPORTED WITH ONE SACK SLURRY CONCRETE OR AS DIRECTED BY THE OWNER.

31. SIGNS REQUIRE SEPARATE APPROVALS AND PERMITS.

32. CONCRETE ENCASEMENT SHALL BE PROVIDED IN THE LENGTHS SHOWN, AND LOCATED TO PROVIDE THE ENCASEMENT WITH EQUAL LENGTHS EXTENDING BEYOND THE UTILITY(IES) BEING CROSSED PER MAG STANDARD DETAIL 404.

33. LIMITS OF CONSTRUCTION LINE (LOC) SHALL BE CONTAINED WITHIN THE CONSTRUCTION FENCING AS APPROVED BY OWNER.

34. FINISHED GRADE SHALL MATCH THE EXISTING GRADE AS SHOWN AND SPECIFIED.

35. THE CONTRACTOR SHALL ATTEMPT TO MINIMIZE CONDUIT BENDS WHEN ENTERING A PULL BOX.

36. TOWN CONSTRUCTION MANAGER SHALL APPROVE THE FINAL LOCATION OF ITS PULL BOXES PRIOR TO INSTALLATION.

37. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS FOR SALVAGING PROTECTED NATIVE PLANTS PRIOR TO THE START OF CONSTRUCTION.

38. ANY DEVIATION FROM THE APPROVED PLANS SHALL BE REVIEWED AND APPROVED BY THE ENGINEER PRIOR TO THAT CHANGE BEING INCORPORATED INTO THE PROJECT.

39. ANY SPECIAL INSPECTION REQUIRED SHALL BE IN ADDITION TO ANY ROUTINE INSPECTION BY THE TOWN.

40. FOR ALL BURIED VALVES, NEW, RELOCATED OR ADJUSTED, CONTRACTOR SHALL CONSTRUCT BLOCKING PER M.A.G. STANDARD DETAILS NO. 301 AND SHALL PROVIDE A VALVE BOX PER M.A.G. STANDARD DETAIL NO. 391, TYPE 'C' WITH A DEBRIS CAP IN ACCORDANCE WITH M.A.G. STD DTL NO. 392.

41. ALL POTABLE WATERLINES AND FITTINGS SHALL HAVE A NSF-PW SEAL. ALL MATERIALS AND PRODUCTS USED IN THE POTABLE WATER SYSTEM SHALL CONFORM TO NSF STANDARDS 60 AND 61 IN ACCORDANCE WITH AAC R18-4-119. ALL MATERIALS SHALL BE LEAD-FREE AS DEFINED IN AAC R18-4-504 AND R18-4-101.

42. TRENCHES SHALL BE CONSTRUCTED IN ACCORDANCE WITH MAG STD. DET. 350-1. FOR WATER AND SEWER LINES WHICH ARE TWELVE (12) INCHES AND UNDER, TRENCH SHALL BE CONSTRUCTED TO PROVIDE SUPPORT UNDER FULL LENGTH OF THE BARREL WITH HAND EXCAVATED HOLES FOR COUPLINGS AND/OR BELLS.

43. WATER MAIN AND SANITARY SEWER MAIN SEPARATION AND/OR EXTRA PROTECTION SHALL BE IN ACCORDANCE WITH M.A.G. STD. DET. 404-1. AN ALTERNATIVE TO CONSTRUCTING SANITARY SEWER MAIN WITH MECHANICAL JOINT OR RESTRAINED JOINT DUCTILE IRON PIPE MAY CONSIST OF CONCRETE ENCASEMENT PER M.A.G. STD. DET. 404-2.

44. APPROVED 'AS-BUILT' PLANS PRODUCED AND CERTIFIED FOR CORRECTNESS BY A REGISTERED PROFESSIONAL CIVIL ENGINEER OR LAND SURVEYOR REGISTERED IN THE STATE OF ARIZONA WILL BE REQUIRED PRIOR TO FINAL APPROVAL OF WATER AND SEWER CONSTRUCTION. THE "AS-BUILT" PLANS SHALL INCLUDE THE LOCATIONS OF ALL VERTICAL AND HORIZONTAL PIPE BENDS, VALVES, MANHOLES, SEWER TAPS, ETC., BY STATION/OFFSET AND NORTHING AND EASTING STATE PLANE COORDINATES.

45. BACKFLOW PREVENTION ASSEMBLIES SHALL HAVE A CERTIFICATE OF APPROVAL ISSUED BY USC-FCCCHR, OR OTHER APPROVED THIRD-PARTY CERTIFYING ENTITY UNRELATED TO THE PRODUCT MANUFACTURER OR VENDOR, IN ACCORDANCE WITH AAC R18-4-115. ALL ASSEMBLIES SHALL BE INSTALLED IN ACCORDANCE WITH MAG STANDARD DETAILS. NO ASSEMBLY SHALL BE PLACED IN SERVICE UNLESS IT HAS BEEN TESTED AND IS FUNCTIONING AS DESIGNED. A CERTIFIED TEST MUST BE SUBMITTED TO TOWN OF TAYLOR (BACKFLOW PREVENTION) FOR APPROVAL. OPERATIONAL APPROVAL OF WATER FACILITIES WILL NOT BE GRANTED PRIOR TO BACKFLOW PREVENTION APPROVAL.

46. ALL CONSTRUCTION MATERIALS USED FOR ANY FACILITIES CONNECTED TO OR PART OF THE PUBLIC WATER SYSTEM SHALL BE LEAD-FREE AS DEFINED IN AAC-R18-4-101.

44. ALL WORK AND TESTING SHALL BE IN ACCORDANCE WITH MARICOPA ASSOCIATION OF GOVERNMENTS (M.A.G.) STANDARD SPECIFICATIONS AND DETAILS UNLESS OTHERWISE STATED ON PLANS.

45. ALL WATER LINES SHALL BE DISINFECTED PER ADEQ BULLETIN NO. 8 OR BY AWWA C651-05.

46. ALL WATER LINES SHALL BE PRESSURE AND LEAKAGE TESTED PER M.A.G. SPECIFICATION 610.15.

47. ALL WATER LINE PIPE, FITTINGS, VALVES, FIRE HYDRANTS SHALL CONFORM TO THE LATEST AWWA AND ASTM STANDARDS.

48. ALL GRAVITY LINES SHALL BE PRESSURE AND LEAKAGE TESTED PER ASTM F1417.

49. ALL MANHOLES SHALL BE TESTED FOR WATER TIGHTNESS PER R18-9-E301(D)(3)(E).

50. ALL FORCEMAINS SHALL BE PRESSURE AND LEAKAGE TESTED PER AAC R18-9-E301(D)(4)(F).

51. UNIFORM SLOPE TESTING IS REQUIRED ON ALL SEWER LINES BY VIDEOTAPE AND VACUUM OR WATER TEST ALL MANHOLES IN ACCORDANCE WITH AAC R18-9-E301. TESTING DOCUMENTS AND VIDEOTAPES SHALL BE SUBMITTED FOR APPROVAL PRIOR TO OPERATIONAL ACCEPTANCE. ALL REQUIRED REPAIRS ARE THE RESPONSIBILITY OF THE CONTRACTOR.

52. MANDREL TESTING IS REQUIRED ON ALL SEWER SEGMENTS PER AAC R18-9-E301(D)(2)(i).

53. PVC PIPE INSTALLATION MUST CONFORM WITH ASTM STANDARD SPECIFICATION D2321.

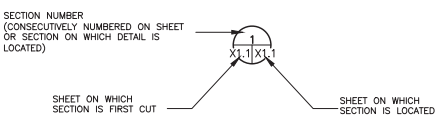
54. DEFLECTION TESTS SHALL CONFORM TO M.A.G. SPECIFICATION SECTION 615.11.

APS NOTES

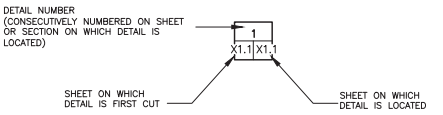
1. THE CONTRACTOR SHALL EXERCISE CAUTION WHEN WORKING ON SITE AND TO BE AWARE OF THE "ENERGIZED OVERHEAD DISTRIBUTION LINES". THE CONTRACTOR SHALL CONTACT APS 3 DAYS PRIOR TO WORKING AROUND OR NEAR OUR FACILITIES.

SHEET CATEGORY

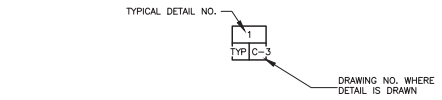
G	–	GENERAL	D	–	DETAILS	FP	– FIRE PROTECTION
C	–	CIVIL	NP	–	NATIVE PLANTS	E	– ELECTRICAL
S	–	STRUCTURAL	L	–	LANDSCAPE	I	– INSTRUMENTATION AND CONTROLS
A	–	ARCHITECTURAL	H	–	HVAC		
M	–	MECHANICAL	P	–	PLUMBING		



SECTION KEY



DETAIL KEY



TYPICAL DETAIL

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Registered Professional Engineer (Civil) CERTIFICATE NO. 32324 TERESA ANN VALENTINE DATE SIGNED ARIZONA U.S.A.

REVISIONS			
NO.	BY	DATE	REMARKS

DES TAV/JA
DWN JA
CKD MPV

SMCFD

SMCFD NO.1
RECHARGE FACILITIES IMPROVEMENTS
5661 S. IRONWOOD DRIVE
APACHE JUNCTION, AZ 85120

GENERAL
RECHARGE FACILITY IMPROVEMENTS CONSTRUCTION NOTES
SCALE: NONE

DATE: OCTOBER 2018
G1
SHEET 2 OF 11
CAD FILE: G1.DWG

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SMCFD – NO.1 RECHARGE FACILITIES IMPROVEMENTS – VOLUME 1 OF 2

FILE: Z:\17SMCFD\RECHARGE\EARTHWORK SET\GENERAL\G1.DWG G1 (10-24-18) JACOSTA
Project 25.00 - Bid Package

ABBREVIATIONS

AC	ASPHALT CONCRETE
ACI	AMERICAN CONCRETE INSTITUTE
APN	ASSESSOR'S PARCEL NUMBER
AR	AIR RELEASE VALVE
ARFC	AS REQUIRED FOR CONSTRUCTION
ASME	AMERICAN SOCIETY OF MECHANICAL ENGINEERS
ASPH	ASPHALT
ASS	ASSEMBLY
@	AT
AVR	AIR/VACUUM RELIEF VALVE
AVAIL	AVAILABLE
AWWA	AMERICAN WATER WORKS ASSOCIATION
BOC	BACK OF CURB
BC	BEGIN HORIZONTAL CURVE
BO	BLOW OFF
BOL	BEGINNING OF LINE
BLDG	BUILDING
B.S.L.	BUILDING SET BACK LINE
B.V.C.	BEGIN VERTICAL CURVE
C	CENTER
℄	CENTER TO CENTER
CA	CEMENT ASBESTOS
CATV	CABLE TELEVISION
CBC	CONCRETE BOX CULVERT
C.C.S.	CONCRETE CYLINDER PIPE
CFS	CUBIC FEET PER SECOND
CIP	CAST IRON PIPE
	CENTERLINE
CLR	CLEAR
CM	CORRUGATED METAL
CMC	CEMENT MORTAR COATED
CML	CEMENT MORTAR LINED
CML&C	CEMENT MORTAR LINED & COATED
CMP	CORRUGATED METAL PIPE
CO	CLEAN OUT
CONC	CONCRETE
CONST	CONSTRUCTION
CPLG	COUPLING
D	DRAIN
DG	DECOMPOSED GRANITE
DTL	DETAIL
DI	DRAIN INLET
DIA	DIAMETER
DIP	DUCTILE IRON PIPE
D/L	DAYLIGHT
DWG	DRAWING
EA	EACH
EC	END HORIZONTAL CURVE
E.F.	EACH FACE
EHH	ELECTRIC HANDHOLE
EL	ELEVATION
ELEC	ELECTRIC
E'LY	EASTERLY
EM	ELECTRIC METER
EOP	EDGE OF PAVEMENT
EP	ELECTRIC PANEL
EPED	ELECTRIC PEDESTAL
EV	ELECTRIC VAULT
E.V.C.	END VERTICAL CURVE
EOL	END OF LINE
E.W.	EACH WAY
EXIST	EXISTING
FAD	FOUL AIR DUCT
FND	FOUND
F.F.	FINISHED FLOOR
FE	FINISHED EFFLUENT
FH	FIRE HYDRANT
FL	FLOW LINE
FLG	FLANGE
FM	FORCE MAIN
FP	FLAG POLE
GA	GUAGE
GAL	GALLON
GALV	GALVANIZED
GP	GUY POLE
GPT	GUARD POST
GSV	GAS VALVE
GW	GUY WIRE
HDWL	HEADWALL
HH	HAND HOLE
HORIZ	HORIZONTAL
HPG	HIGH PRESSURE GASLINE
ID	INSIDE DIAMETER
IE	INVERT ELEVATION
INV	INVERT
IRRIG	IRRIGATION
L	CURVE LENGTH
LF	LINEAR FEET
LOC	LIMITS OF CONSTRUCTION
LS	LUMP SUM
LT	LEFT
M.A.G.	MARICOPA ASSOCIATION OF GOVERNMENTS
MAX	MAXIMUM
MB	MAILBOX
MH	MANHOLE
MIN	MINIMUM
M.O.	MARKOUT
MRKD	MARKED
MTR	METER
MW	MANWAY
N.A.O.S.	NATURAL AREA OPEN SPACE
N.C.	NORMALLY CLOSED
N.O.	NORMALLY OPEN
NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
N.T.S.	NOT TO SCALE
NO.	NUMBER
NPW	NON-POTABLE WATER
OFF	OFFSET
O.C.	ON CENTER
OD	OUTSIDE DIAMETER
PCCP	PRESTRESSED CONCRETE CYLINDER PIPE
PED	PEDESTAL
P.I.	HORIZONTAL POINT OF INFLECTION
PLCS	PLACES
PMH	PROPOSED MANHOLE
PRA	PRESSURE REGULATING ASSEMBLY
PRES	PRESSURE
PV	PLUG VALVE
PVC	POLYVINYL CHLORIDE PIIPE
PW	POTABLE WATER
R	RADIUS OR RESTRAINED JOINT
RCCP	REINFORCED CONCRETE CYLINDER PIPE
RCP	REINFORCED CONCRETE PIPE
REG.	REGIONAL
REQ'D	REQUIRED
RR	RAILROAD
R/W	RIGHT-OF-WAY
ROW	RIGHT-OF-WAY
RT	RIGHT
SE	SECONDARY EFFLUENT
SEC	SECTION
SCO	SEWER CLEAN OUT
SD	STORM DRAIN
SDMH	STORM DRAIN MANHOLE
SDR	STANDARD DIMENSION RATIO
SIM	SIMILAR
SMH	SEWER MANHOLE
SHT	SHEET
SPEC(S)	SPECIFICATION(S)
SQ	SQUARE
SY	SQUARE YARDS
SS	SANITARY SEWER
SSFM	SANITARY SEWER FORCEMAIN
STA	STATION
STD	STANDARD
STL	STEEL
STLT	STREET LIGHT
T	TANGENT
t	STEEL THICKNESS
T/B	TOP AND BOTTOM
TC	TOP OF CURB
TELE	TELEPHONE
THH	TELEPHONE HANDHOLE
THK	THICK
TG	TOP OF GRATE
TOW	TOE OF SLOPE
T.O.P.	TOP OF PIPE
TPED	TELEPHONE PEDESTAL
TPOLE	TELEPHONE POLE
TRANS	TRANSFORMER
TYP	TYPICAL
UG	UNDERGROUND
UGE	UNDERGROUND ELECTRICAL
UTELE	UNDERGROUND TELEPHONE
VAC	VACUUM
VERT	VERTICAL
VLV	VALVE
V.P.I.	VERTICAL POINT OF INTERSECTION
W	WATERLINE
W/	WITH
WGV	WATER GATE VALVE
W'LY	WESTERLY
WM	WATER METER
WMH	WATER MANHOLE
WS	WATER SERVICE
WSP	WELDED STEEL PIPE
WV	WATER VAULT
XMH	EXISTING MANHOLE
YD	YARD
YH	YARD HYDRANT
Δ	DELTA ANGLE
ø	DIAMETER
#	NUMBER

LEGEND

SYMBOL	ITEM
	EXISTING BUILDING/STRUCTURE
	NEW BUILDING/STRUCTURE
—x——x—	EXISTING FENCE
—x——x—	NEW FENCE
326	EXISTING GROUND CONTOUR
326	FINISH GRADE CONTOUR
	EXISTING CURVEBACK, CURB, AND GUTTER
	EXISTING SIDEWALK
	EXISTING ROADWAY
	EXISTING DITCH
	EXISTING FIRE HYDRANT
	NEW FIRE HYDRANT
Ⓢ	EXISTING SEWER MANHOLE
Ⓢ	NEW SEWER MANHOLE
APN 123-456-78	PARCEL NUMBER
	EASEMENT LINE
1283 / 1283	HORIZONTAL AND VERTICAL CONTROL POINT
× 1349.2	SPOT ELEVATION
Ⓥ	EXISTING IRRIGATION VALVE BOX
Ⓜ	EXISTING UTILITY METER
	EXISTING BUSH OR TREE
	EXISTING CACTUS
	EXISTING PALM TREE
	EXISTING VALVE
CB	EXISTING CATCH BASIN
SIGN	EXISTING POST/SIGN
Ⓦ	EXISTING WELL
	EXISTING REDUCER
	EXISTING CAP
	EXISTING POWER POLE
	EXISITNG AIR RELEASE VALVE
	EXISTING TRAFFIC LIGHT
CO	EXISTING CLEAN OUT
CO	CLEAN OUT
	DRAINAGE DIRECTION
	DEMOLISH AND REMOVE
CONCRETE ENCASEMENT	CONCRETE ENCASEMENT
	GROUND PROFILE, EXISTING
00+00	CENTERLINE
	NEW SEWER LINE IN PROFILE
R/W	RIGHT-OF-WAY LINE
P/L	PROPERTY LINE
E	EXISTING ELECTRICAL
2"W	EXISTING 2" PIPING

FLANGED FITTINGS

SYMBOL	ITEM
	CROSS
	CROSS UP
	TEE
	TEE UP
	TEE DOWN
	REDUCING TEE
	REDUCING TEE UP
	LATERAL
	LATERAL DOWN
	LATERAL UP
	22.5° ELBOW
	45° ELBOW
	45° ELBOW DOWN
	45° ELBOW UP
	REDUCING ELBOW
	90° ELBOW LONG
	90° ELBOW LONG DOWN
	90° ELBOW LONG UP
	90° ELBOW SHORT
	90° ELBOW SHORT DOWN
	90° ELBOW SHORT UP
	CONCENTRIC/ECCENTRIC REDUCER
	FLEXIBLE COUPLING
	DAMPER VALVE
	GATE VALVE
	PLUG VALVE
	CHECK VALVE

MECHANICAL JOINT FITTINGS

	CROSS
	TEE
	REDUCING TEE
	LATERAL
	90° ELBOW LONG
	45° ELBOW
	22.5° ELBOW
	REDUCER

SINGLE LINE FITTINGS

	TEE
	TEE UP
	TEE DOWN
	LATERAL
	90° ELBOW
	45° ELBOW
	90° ELBOW DOWN
	90° ELBOW UP
	UNION
	CONCENTRIC REDUCER
	ECCENTRIC REDUCER
	CAP PLUG
	GATE VALVE

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15845 South 46th Street, Suite 144 Phoenix, Arizona 85048
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Registered Professional Engineer (Civil) CERTIFICATE NO. 32324 TERESA ANN VALENTINE DATE SIGNED ARIZONA U.S.A.

REVISIONS			
NO.	BY	DATE	REMARKS

DES TAV/JA
DWN JA
CKD MPV

SMCFD

SMCFD NO.1
RECHARGE FACILITIES IMPROVEMENTS
5661 S. IRONWOOD DRIVE
APACHE JUNCTION, AZ 85120

GENERAL
RECHARGE FACILITY IMPROVEMENTS
ABBREVIATIONS AND LEGEND
SCALE: NONE

DATE: OCTOBER 2018
G2
SHEET 3 OF 11
CAD FILE: G2.DWG

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Project 25.00 - Bid Package

SMCFD – NO.1 RECHARGE FACILITIES IMPROVEMENTS – VOLUME 1 OF 2

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DES TAV/JA
DWN JA
CKD MPV

SMCFD

SMCFD NO.1
RECHARGE FACILITIES IMPROVEMENTS
5661 S. IRONWOOD DRIVE
APACHE JUNCTION, AZ 85120

CIVIL
RECHARGE FACILITY IMPROVEMENTS EXISTING SITE PLAN
SCALE: 1"=120'

DATE: OCTOBER 2018
C1
SHEET 4 OF 11
CAD FILE: C1.DWG

FILE: Z:\17SMCFD\RECHARGE\EARTHWORK SET\CIVIL\C1.DWG C1 (10-24-18) JACOSTA
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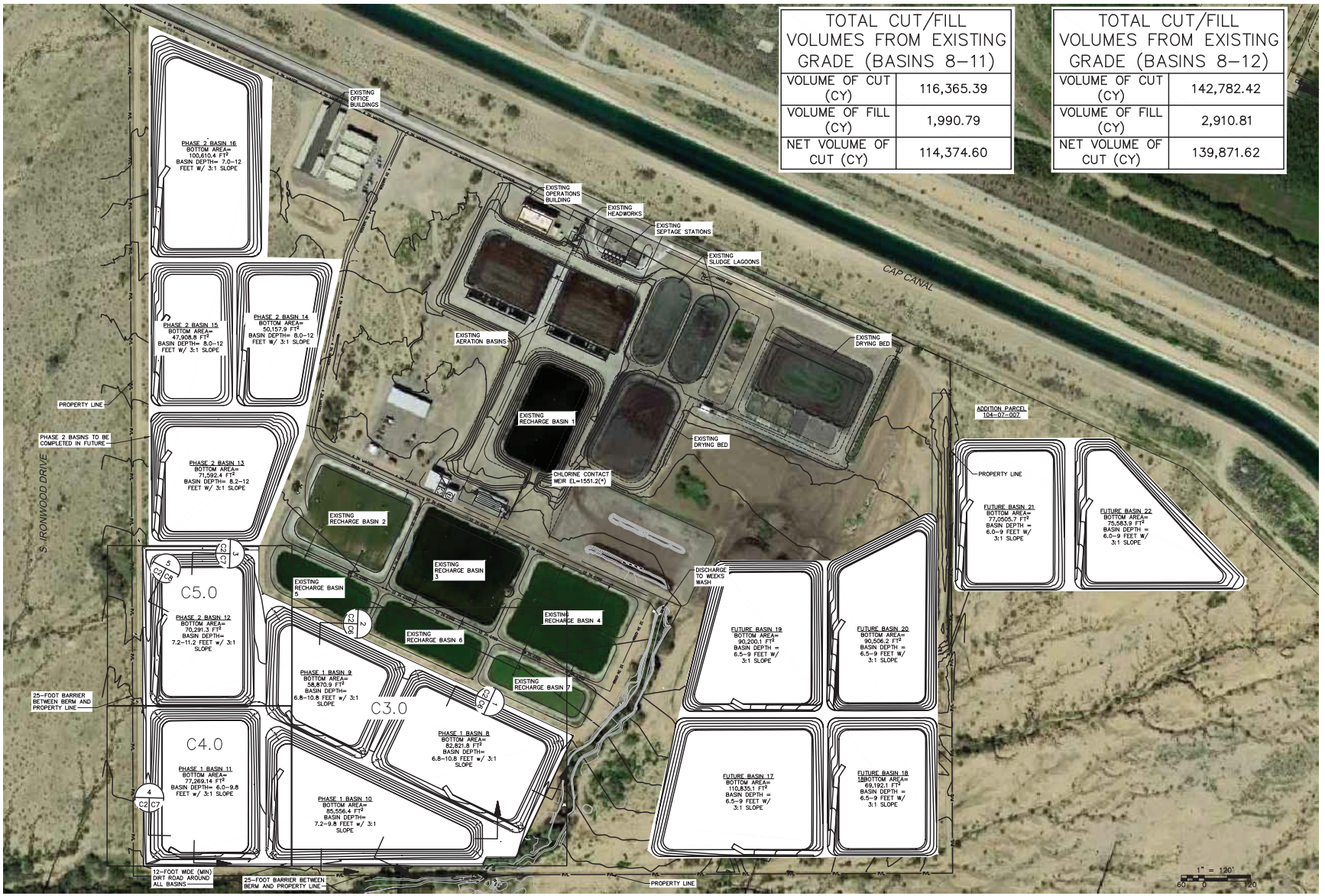
TOTAL CUT/FILL VOLUMES FROM EXISTING GRADE (BASINS 8–11)	
VOLUME OF CUT (CY)	116,365.39
VOLUME OF FILL (CY)	1,990.79
NET VOLUME OF CUT (CY)	114,374.60

TOTAL CUT/FILL VOLUMES FROM EXISTING GRADE (BASINS 8–12)	
VOLUME OF CUT (CY)	142,782.42
VOLUME OF FILL (CY)	2,910.81
NET VOLUME OF CUT (CY)	139,871.62



N.

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SMCFD – NO.1 RECHARGE FACILITIES IMPROVEMENTS – VOLUME 1 OF 2

VALENTINE
Environmental Engineers, LLC
15845 South 46th Street, Suite 144 Phoenix, Arizona 85048
Phone: (480) 283 - 8991 Fax: (480) 283 - 0082

Registered Professional Engineer (Civil) CERTIFICATE NO. 32324 TERESA ANN VALENTINE DATE SIGNED ARIZONA U.S.A.

REVISIONS			
NO.	BY	DATE	REMARKS

DES TAV/JA
DWN JA
CKD MPV

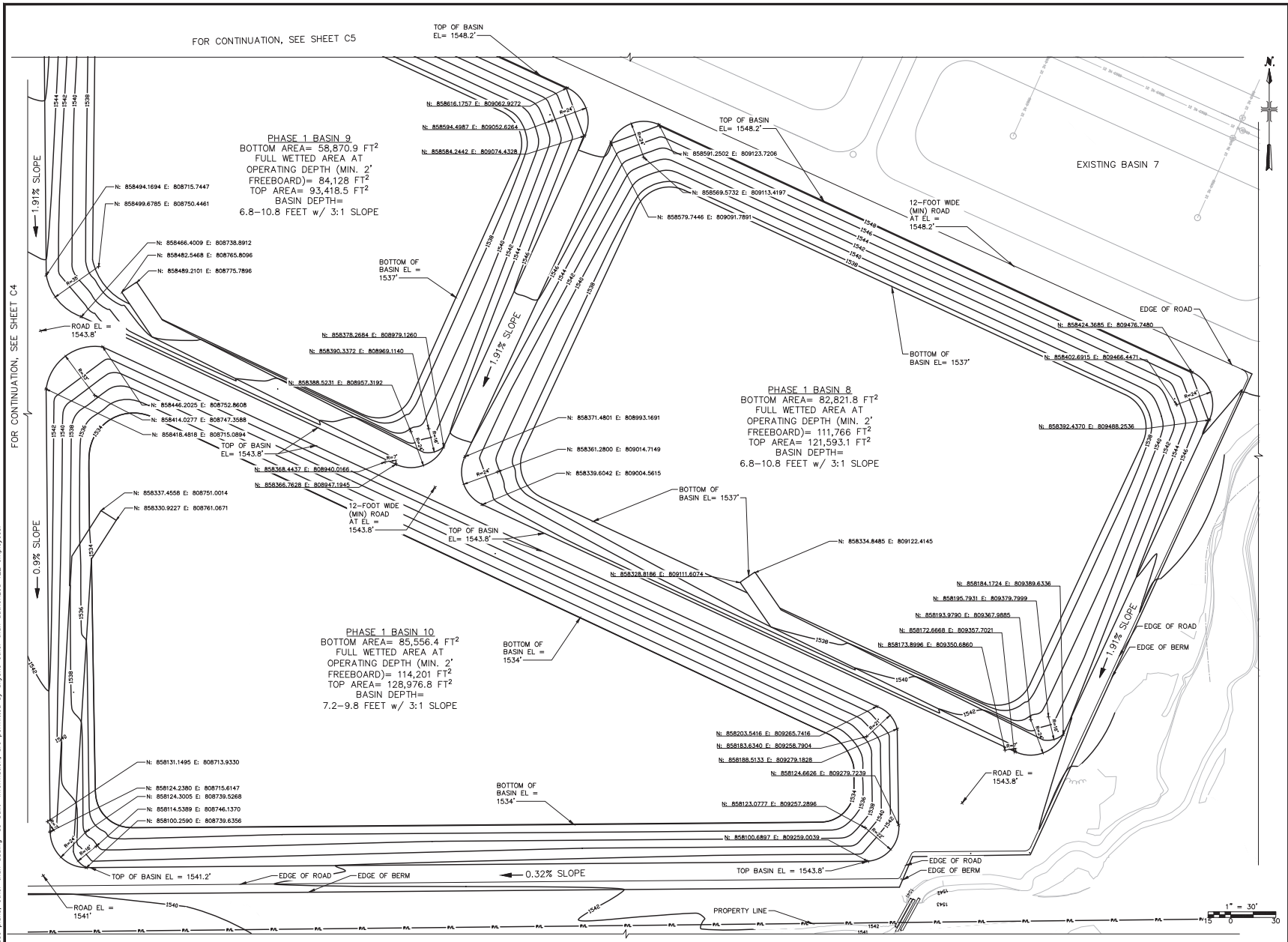
SMCFD

SMCFD NO.1
RECHARGE FACILITIES IMPROVEMENTS
5661 S. IRONWOOD DRIVE
APACHE JUNCTION, AZ 85120

CIVIL
RECHARGE FACILITY IMPROVEMENTS
OVERALL SITE PLAN
SCALE: 1" = 120'

DATE: OCTOBER 2018
C2
SHEET 5 OF 11
CAD FILE: C2.DWG

FILE: Z:\17SMCFD\RECHARGE\EARTHWORK SET\CIVIL\C2.DWG C1 (10–24–18) JACOSTA
Project 25.tab – Bid Package



CONSTRUCTION NOTES

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5661 S. IRONWOOD DRIVE
APACHE JUNCTION, AZ 85120

CIVIL
RECHARGE FACILITY IMPROVEMENTS ENLARGED PLAN 1
SCALE: 1" = 30'-0"

DATE: OCTOBER 2018
C3
SHEET 6 OF 11
CAD FILE: C3.DWG

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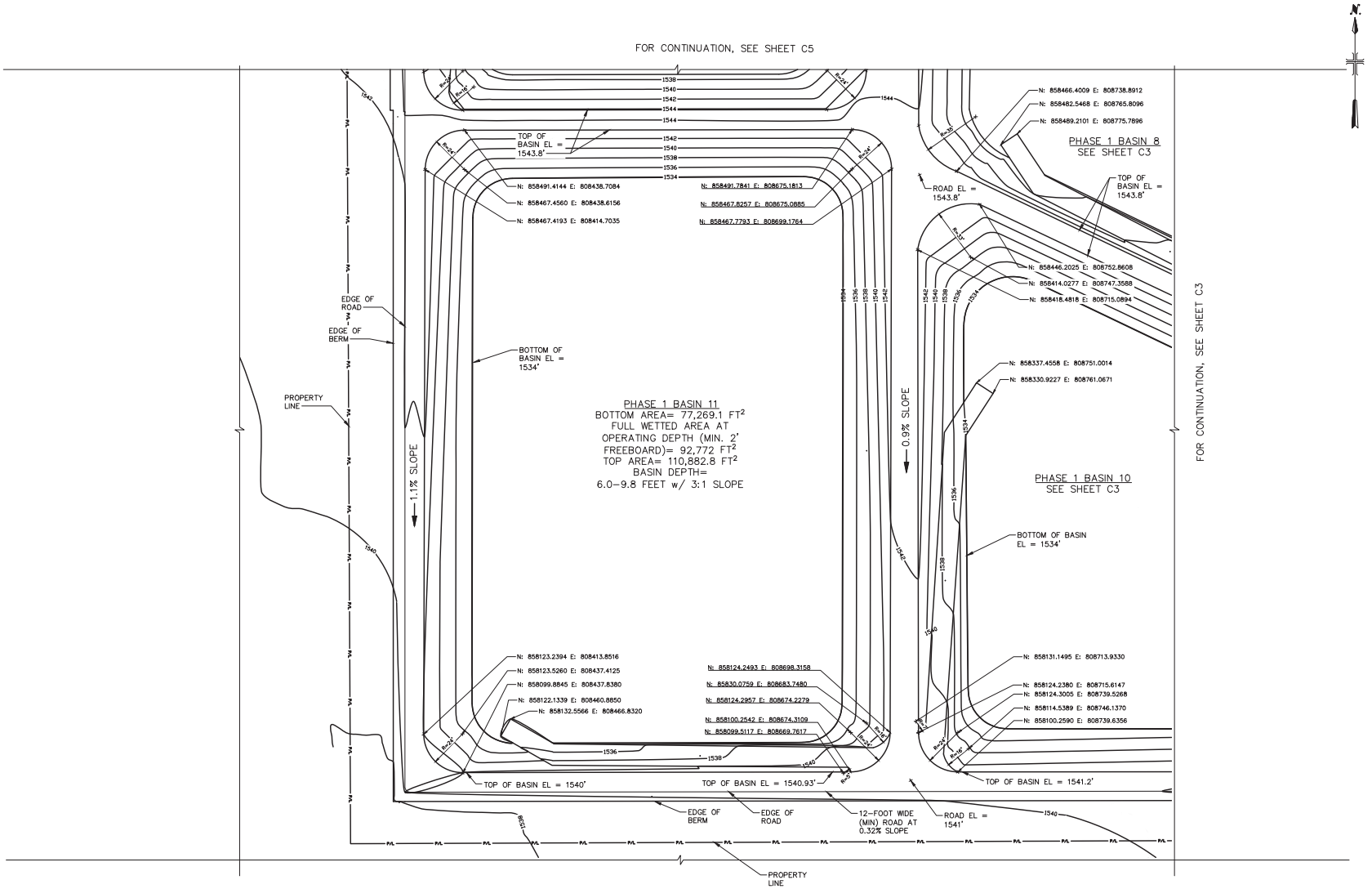
Project 25.xlsx - Bid Package

SMCFD – NO.1 RECHARGE FACILITIES IMPROVEMENTS – VOLUME 1 OF 2

CONSTRUCTION NOTES



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REVISIONS			
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SMCFD

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RECHARGE FACILITIES IMPROVEMENTS
5661 S. IRONWOOD DRIVE
APACHE JUNCTION, AZ 85120

CIVIL
RECHARGE FACILITY IMPROVEMENTS ENLARGED PLAN 2
SCALE: 1" = 30'–0"

DATE: OCTOBER 2018
C4
SHEET 7 OF 11
CAD FILE: C4.DWG

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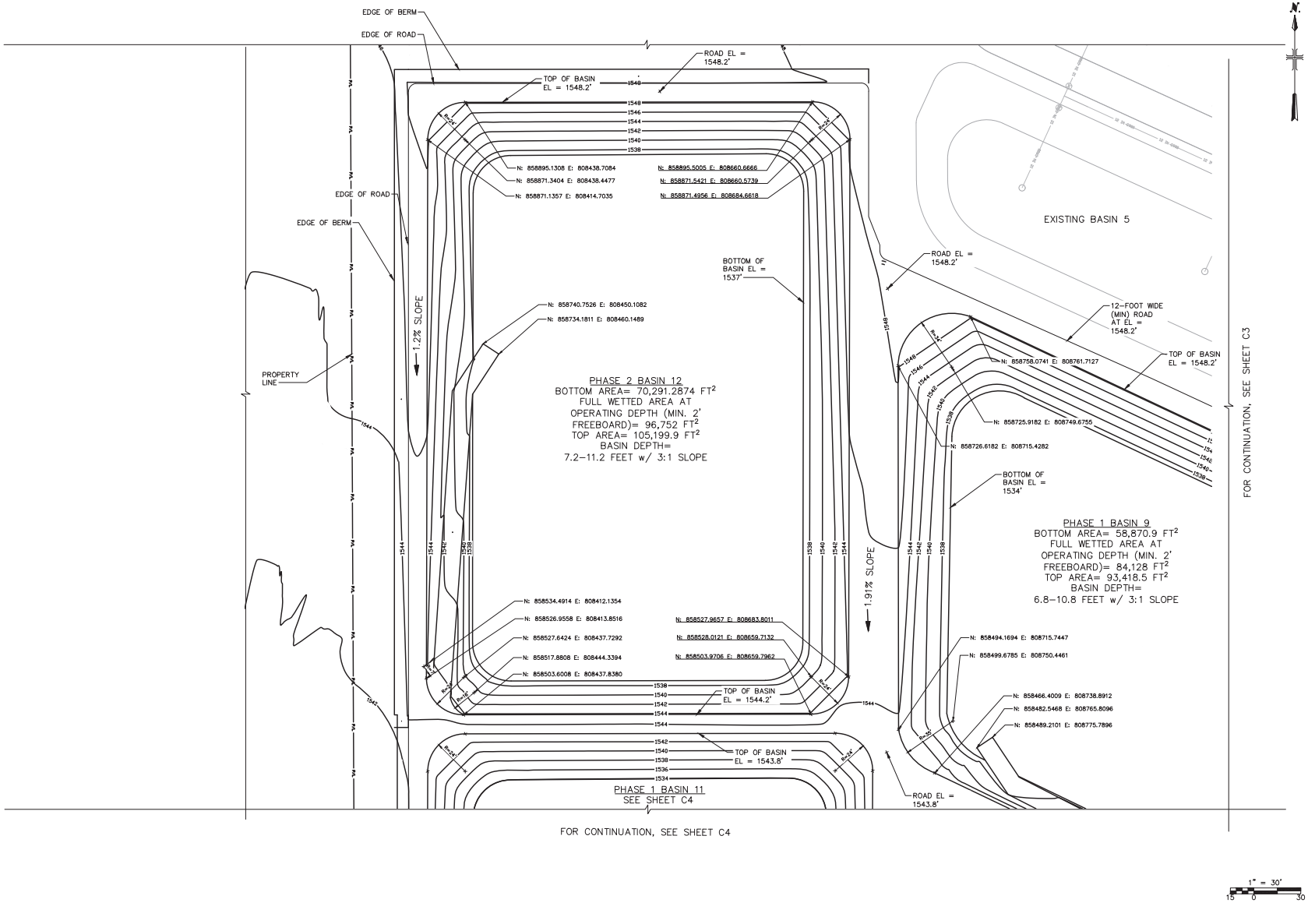
FILE: Z:\17SMCFD\RECHARGE\EARTHWORK SET\CIVIL\C4.DWG C1 (10–24–18) JACOSTA
Project 25.08 – Bid Package

SMCFD – NO.1 RECHARGE FACILITIES IMPROVEMENTS – VOLUME 1 OF 2

CONSTRUCTION NOTES



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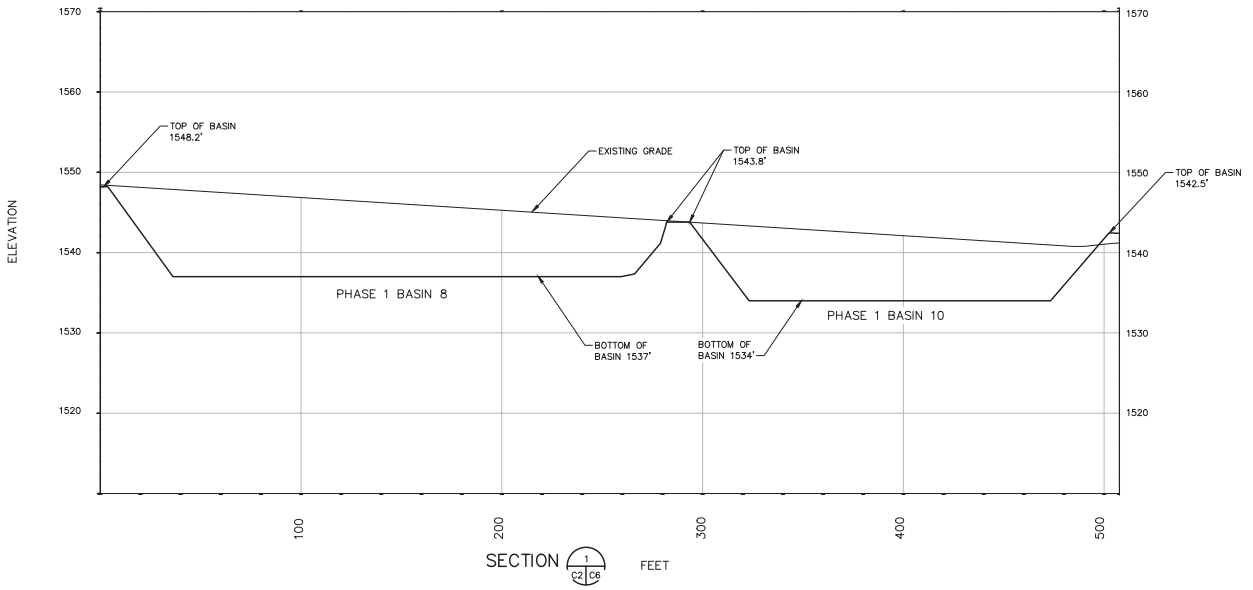
RECHARGE FACILITIES IMPROVEMENTS
5661 S. IRONWOOD DRIVE
APACHE JUNCTION, AZ 85120

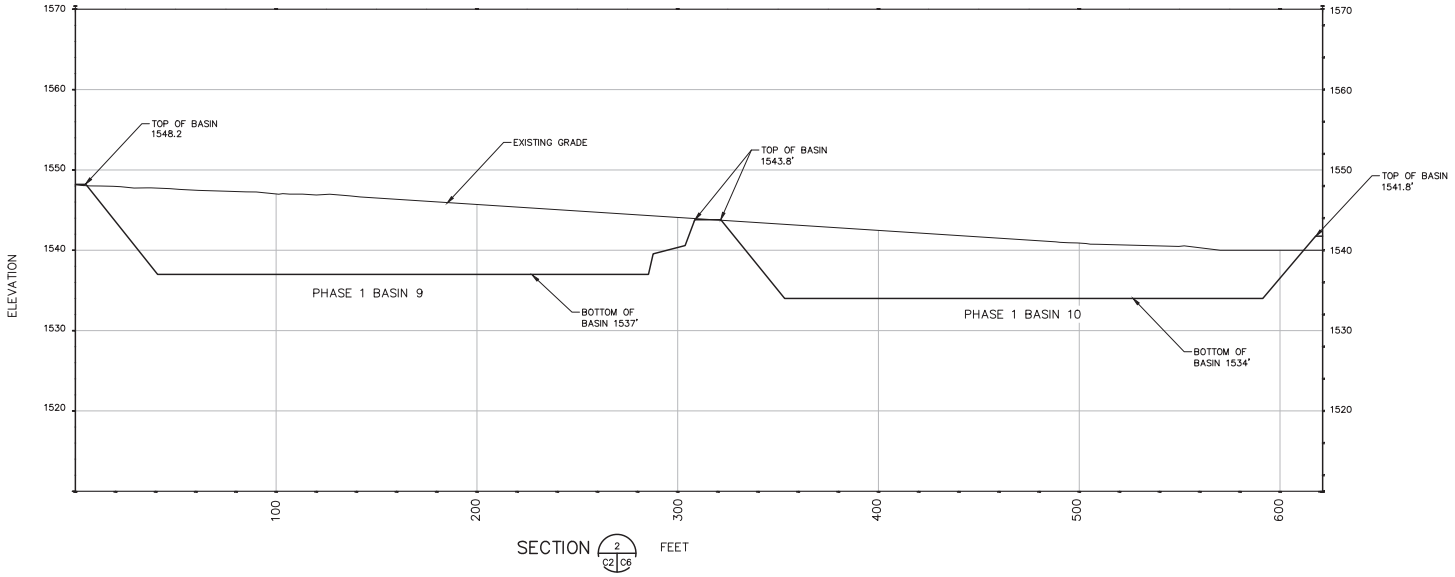
CIVIL
RECHARGE FACILITY IMPROVEMENTS
ENLARGED PLAN 3
SCALE: 1" = 30'–0"

DATE: OCTOBER 2018
C5
SHEET 8 OF 11
CAD FILE: C5.DWG

FILE: Z:\17SMCFD\RECHARGE\EARTHWORK SET\CIVIL\C5.DWG C1 (10-24-18) JACOSTA
Project 25.08 - Bid Package

SMCFD – NO.1 RECHARGE FACILITIES IMPROVEMENTS – VOLUME 1 OF 2





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Registered Professional Engineer (Civil)
CERTIFICATE NO.
32324
TERESA ANN
VALENTINE
ARIZONA, U.S.A.
Date Signed

REVISIONS			
NO.	BY	DATE	REMARKS

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SMCFD

SMCFD NO.1
RECHARGE FACILITIES IMPROVEMENTS
5661 S. IRONWOOD DRIVE
APACHE JUNCTION, AZ 85120

CIVIL
RECHARGE FACILITY IMPROVEMENTS
BASIN SECTIONS 1
SCALE: 1" = 30'

DATE: OCTOBER 2018
C6
SHEET 9 OF 11
CAD FILE: C6.DWG

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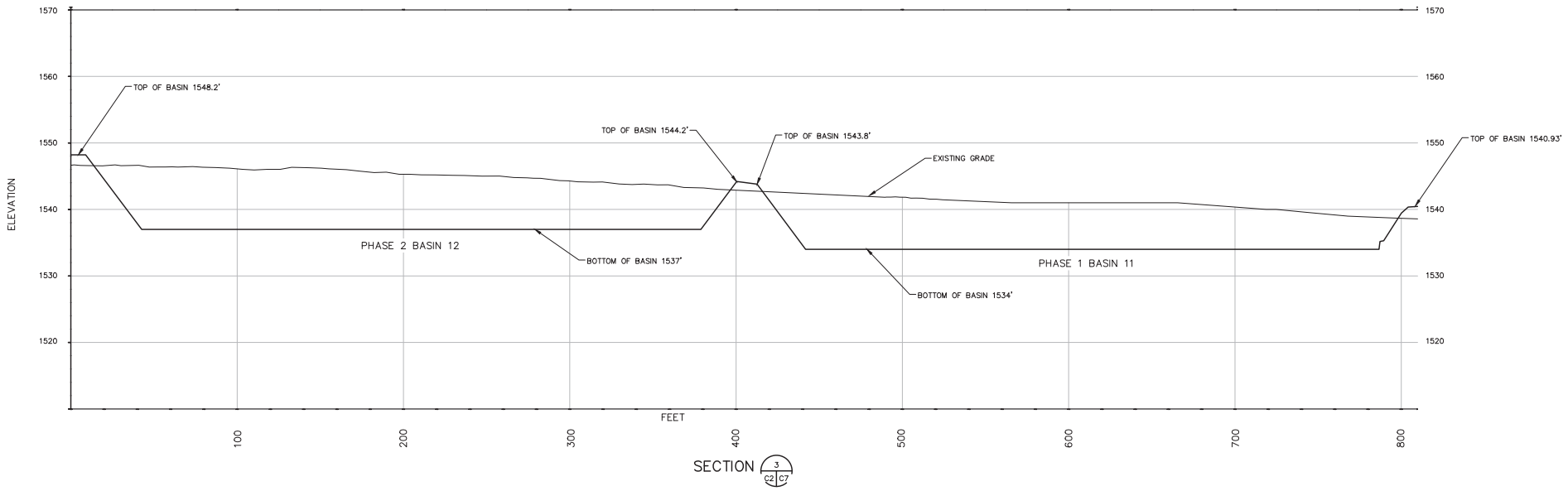
Project 25.08 - Bid Package

SMCFD – NO.1 RECHARGE FACILITIES IMPROVEMENTS – VOLUME 1 OF 2



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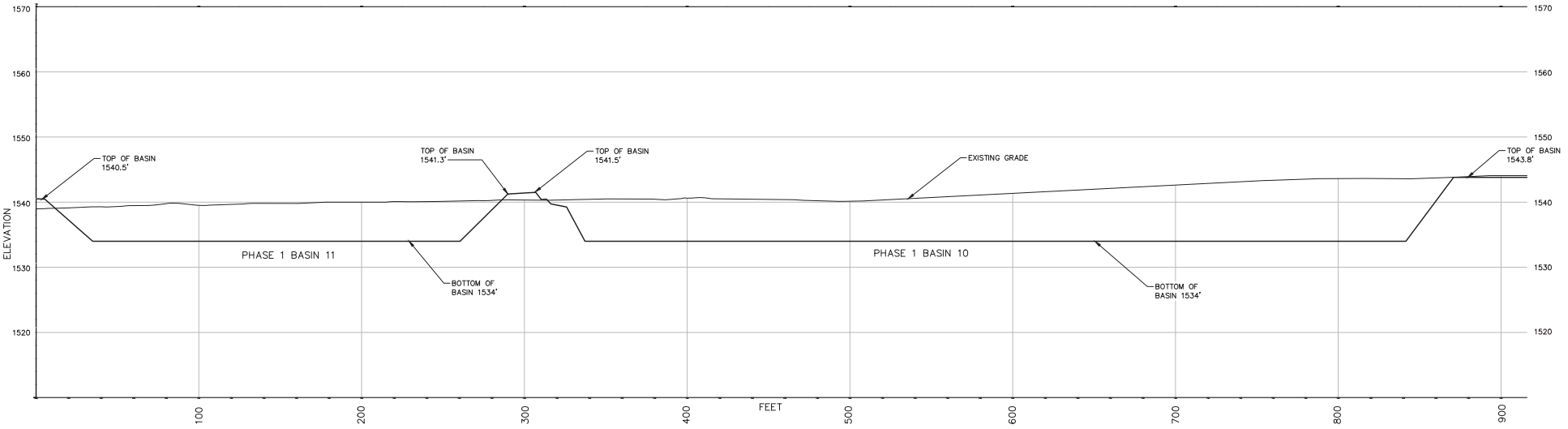

SECTION 4 C2 C7

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REVISIONS			
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SMCFD

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RECHARGE FACILITIES IMPROVEMENTS
5661 S. IRONWOOD DRIVE
APACHE JUNCTION, AZ 85120

CIVIL
RECHARGE FACILITY IMPROVEMENTS
BASIN SECTIONS 2
SCALE: 1"=30'

DATE: OCTOBER 2018
C7
SHEET 10 OF 11
CAD FILE: C7.DWG

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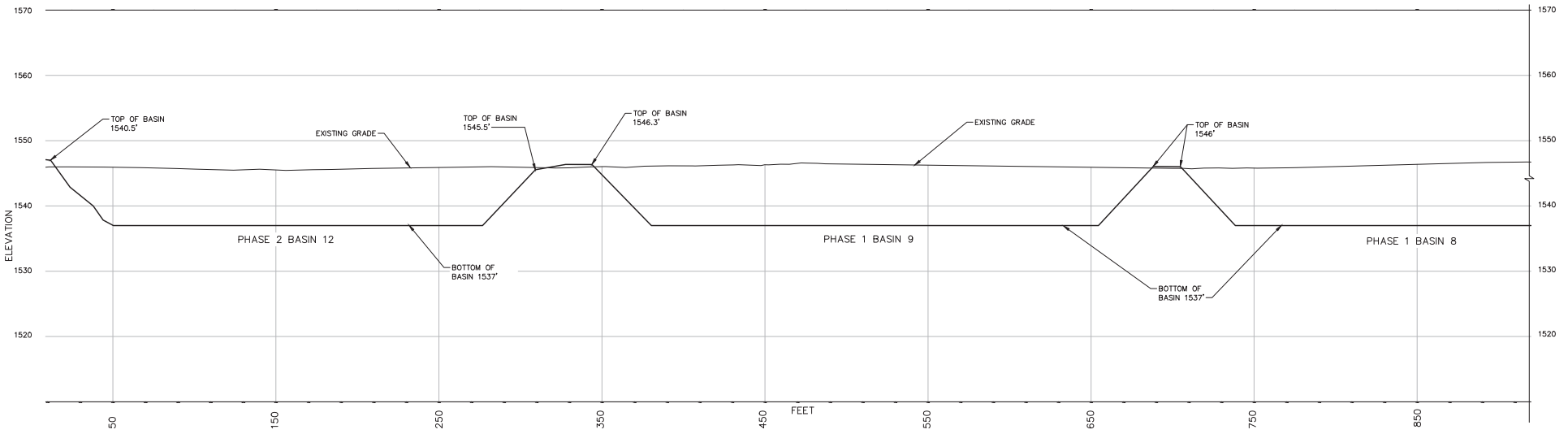
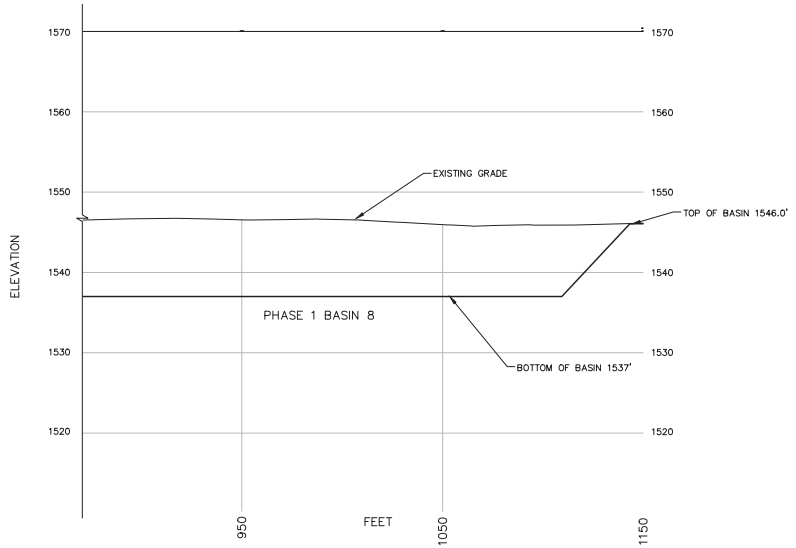
Project 25.00 - Bid Package



SECTION 5 C2 C8



SECTION 5 C2 C8

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5661 S. IRONWOOD DRIVE
APACHE JUNCTION, AZ 85120

CIVIL
RECHARGE FACILITY IMPROVEMENTS
BASIN SECTIONS 3
SCALE: 1"=30'

DATE: OCTOBER 2018
C8
SHEET 11 OF 11
CAD FILE: C8.DWG

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Project 25.08 - Bid Package

Project 25.08
Construction of Recharge Basin No.12

EXHIBIT B
Technical Specifications

Superstition Mountains Community Facilities District

SUPERSTITION MOUNTAINS COMMUNITY FACILTIES DISTRICT RECHARGE FACILITIES IMPROVEMENTS

VOLUME 2 OF 2

TECHNICAL SPECIFICATIONS
DIVISIONS 1 THROUGH 17

SEPTEMBER 2018

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VOLUME 2 OF 2
TECHNICAL SPECIFICATIONS
DIVISIONS 1 THROUGH 17

TABLE OF CONTENTS

TABLE OF CONTENTS

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++END OF TABLE OF CONTENTS++

SECTION 01010

SUMMARY OF WORK

PART 1 – GENERAL

1.1 LOCATION AND DESCRIPTION OF WORK

A. The Work is located on the site of the Superstition Mountains Community Facilities District (SMCFD) Plant No. 1 in Apache Junction, AZ.

B. The Work at the SMCFD Plant No. 1 includes the addition of an effluent splitter structure, a parshall flume metering structure, five new surface recharge basins. The addition of reclaimed water piping for conveyance of the water to the recharge basins and the wash is also included along with valves, piping interconnections and other miscellaneous appurtenances.

C. The Contract Documents include the following:

1. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to these Specifications.
2. Volume 1 of 2 Superstition Mountains Community Facilities District (SMCFD) Plant No. 1 Recharge Facilities Improvements Specifications
3. Volume 2 of 2 Superstition Mountains Community Facilities District (SMCFD) Plant No. 1 Recharge Facilities Improvements Plans

1.2 CONTRACTS

A. The Work shall be constructed under one prime contract.

1.3 WORK BY OTHERS

A. OWNER will perform the following work:
1. Operation of all existing system valves and equipment, unless specified otherwise.

B. Other contracts as follows:
1. None

1.4 SEQUENCE AND PROGRESS OF WORK

A. CONTRACTOR shall submit a Construction Schedule covering the entire Work in accordance with Division 1 of these specifications.

1.5 CONTRACTOR'S USE OF PREMISES

A. CONTRACTOR shall coordinate use of the premises, for his storage and the operations of his workmen, with OWNER and utility service companies.

B. The full use of the premises for storage, the operations of workmen and for all other construction activities will be available to CONTRACTOR. CONTRACTOR must operate entirely within the existing WRF site.

C. CONTRACTOR shall be solely responsible for obtaining and paying all costs in connection with any additional work area, storage sites, access to the site or temporary right-of-way which may be required for proper completion of the Work.

D. It shall be understood that responsibility for protection and safe-keeping of equipment and materials on or near the site will be entirely that of CONTRACTOR and that no claim shall be made against the OWNER or his authorized representatives by reason of any act. It shall be further understood that should any occasion arise necessitating access to the sites occupied by these stored materials or equipment, the OWNER shall direct CONTRACTOR owning or responsible for the stored materials and equipment to immediately move the same. No materials or equipment may be placed upon the property of the OWNER, other than in the designated areas as shown on the Drawings, unless the OWNER has agreed to the location contemplated by CONTRACTOR to be used for storage. All stored materials shall be labeled according to the appropriate contractor or subcontractor with the manufacturer's label as well. Appropriate material safety data sheets (e.g., MSDS) shall be provided.

E. CONTRACTOR shall be required to share use of the premises with other contractors whose services the OWNER has obtained or will obtain for construction of other facilities on the site.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01011

USE OF OWNER'S FACILITIES

PART 1 - GENERAL

1.1 DESCRIPTION

A. CONTRACTOR may use existing facilities or equipment in the Work for construction purposes, only if the OWNER'S written permission is obtained.

B. Restore existing facilities and equipment used for temporary purposes to original condition in a manner satisfactory to OWNER.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01025

MEASUREMENT AND PAYMENT

PART 1 – GENERAL

1.1 DESCRIPTION

A. The items listed below refer to and are the same pay items listed in the Bid Form. They constitute all of the pay items for the completion of the Work. No direct or separate payment shall be made for providing miscellaneous temporary or accessory works, plant services, CONTRACTOR'S or OWNER'S field offices, layout surveys, job signs, sanitary requirements, testing, safety devices, record drawings, water supplies, power, traffic maintenance, removal of waste, watchmen, bonds, insurance, or all other requirements of the General Conditions, Supplementary Conditions, and the General Requirements. Compensation for all such services, items and materials shall be included in the prices stipulated for the lump sum and extra work unit price pay items listed herein.

B. Each extra work unit bid price shall be deemed to include an amount considered by CONTRACTOR to be adequate to cover CONTRACTOR'S overhead and profit for each separately identified item.

1.2 ENGINEER'S ESTIMATE OF QUANTITIES

A. ENGINEER'S estimated quantities for extra work unit price pay items, if any, as listed in the Bid Form, are approximate only and are included solely for the purpose of comparison of Bids. OWNER does not expressly or by implication agree that the nature of the materials encountered below the surface of the ground or the actual quantities of material encountered or required, shall correspond therewith and reserves the right to increase or decrease any quantity or to eliminate any quantity as OWNER may deem necessary. CONTRACTOR shall not be entitled to any adjustment in a unit bid price as a result of any change in an estimated quantity and agrees to accept the aforesaid unit bid prices as complete and total compensation for any additions or deductions caused by changes or alterations in the Work directed by OWNER.

1.3 RELATED PROVISIONS

A. Payments to CONTRACTOR: Refer to General Conditions and Agreement.

B. Changes in Contract Price: Refer to General Conditions.

1.4 QUALITY ASSURANCE

A. Referenced Standards:
   1. Provide quality assurance of measurements and payments as stipulated in the contract conditions.

1.5 SCOPE OF PAYMENT

A. Scope of payment shall be defined in the contract conditions.

1.6 PROGRESS PAYMENTS

A. Progress payments shall be made monthly for percentage of work completed for each bid item.

B. The Contractor shall prepare both monthly and final contract progress payments and submit to the Owner Contract Administrator for approval. Payment shall be based on data received from Contractor, subject to evaluation and concurrence of the OWNER.

C. Contractor shall transmit application for payment to the Owner Contract Administrator on a draft Application for Payment Form provided by the Owner.

D. Attach one Schedule of Value form with each draft application for payment for each lump sum item of work and include a request for payment of materials and equipment on hand as applicable.
   1. Execute certification by authorized officer of Contractor.

E. Preparation:
   1. Round values to the nearest dollar.
   2. List each Change Order and Written Amendment executed prior to date of submission as separate line item.
   3. Totals to equal those shown on the Transmittal Summary Form for each schedule as applicable.

1.7 NONPAYMENT FOR REJECTED OR UNUSED PRODUCTS

A. Payment will not be made for the following:
   1. Loading, hauling, and disposing of rejected material.
   2. Quantities of material wasted or disposed of in manner not called for under Contract Documents.
   3. Rejected loads of material, including material rejected after it has been placed by reason of failure of Contractor to conform to provisions of Contract Documents.
   4. Materials not unloaded from transporting vehicle.
   5. Defective work not accepted by the Owner.
   6. Material remaining on hand after completion of work.

1.8 PARTIAL PAYMENT FOR STORED MATERIAL AND EQUIPMENT

A. No payment will be made to the Contractor for equipment and material.

1.9 SCHEDULE OF VALUES

A. Preliminary Schedule of Values

   1. At the pre-construction meeting, submit to the Owner a Preliminary Schedule of Values for each bid item.
   2. Each schedule will provide a detailed breakdown of the major work components of the applicable bid item.
   3. Schedules of Values shall be provided for each bid item.
   4. The Schedule of Values shall include:
      a. Units.
      b. Unit costs.
      c. Subtotals of breakdown items.

B. Revised Schedule of Values

1. Following receipt of comments on the Preliminary Schedule of Values, the Contractor shall prepare and submit a revised Schedule of Values to the Owner prior to the first payment.
2. Because the ultimate requirement is to develop a detailed Schedule of Values sufficient to determine appropriate monthly progress payments, sufficient detailed breakdowns shall be provided to meet this requirement.
3. The Owner shall be the sole judge of acceptable numbers, details, and descriptions of values established.
4. If, in the opinion of the Owner, a greater number of Schedule of Values items than proposed by the Contractor or as detailed herein is necessary, the Contractor shall add the additional items so identified by the Owner.

C. Changes to Schedule of Values
1. Changes to the CPM Schedule which add activities not included in the original schedule but included in the original work (schedule omissions) shall have values assigned as approved by the Owner Contract Administrator. Other activities shall be reduced to provide equal value adjustment increases for added activities as approved by the Owner Contract Administrator.
2. If the Contractor and Owner Contract Administrator agree to make adjustments to the original Schedule of Values because of inequities discovered in the original accepted detailed Schedule of Values, increases, and equal decreases to values for activities may be made.

PART 2 – MATERIALS AND EXECUTION

The following are Bid Items for this Project and should be used with the attached Bid Tab.

2.1 MOBILIZATION/DEMOBILIZATION—BID ITEM 1

A. Material: The contract lump sum price paid for mobilization shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, for doing all the work involved in mobilization and demobilization.

B. Measurement and Payment: Measurement for payment of the mobilization/demobilization shall be based upon a lump sum amount.

C. Payment for mobilization will be made as follows
1. On the first payment request, 50 percent of the contract item price for mobilization will be included in said estimate for payment.
2. On remaining pay requests, except for the final, shall have no more than 10% of the contract item price for mobilization included in said estimate for payment.
3. Payment for demobilization will follow Final Completion and is assumed to be no more that 10% of the amount for mobilization.

2.2 PROVIDE AND INSTALL PRECAST EFFLUENT SPLITTER STRUCTURE AND GATES—BID ITEM 2

A. Materials: This item includes providing and installing the pre-cast splitter structure complete with access hatch, gates, and piping connections. Payment for this item of work will be full compensation for furnishing all materials, tools, labor, and equipment necessary for installing structure and equipment. Excavation, bedding and backfill are included in this item.

A. Measurement and Payment: Measurement for payment of the installation of the precast effluent splitter structure, gates, hatch, piping connections and excavation/backfill work shall be based upon a lump sum amount.

B. Payment: Payment for the procuring and installation of the precast effluent splitter structure and appurtenances shall be based on the lump sum amount named in the Bid Schedule, which price shall constitute full compensation.

2.3 BELOW GRADE 24-INCH PIPING SYSTEM (C-905) TO NEW RECHARGE BASINS AND WASH —BID ITEM 3

A. Materials: This item includes 24-inch gravity piping system that includes fittings, gate valves and other appurtenances installed below grade from the new effluent splitter box to the new recharge basins and new wash discharge location as shown on the Plans and specified for the Project. Trenching, bedding, and backfill are included in this item.

A. Measurement and Payment: Measurement for payment of the 24-inch gravity piping system installed below grade shall be based upon a linear foot amount, valves and other appurtenances based on lump sum amount.

B. Payment: Payment for the below grade 24-inch gravity piping system shall be based on the linear foot amount, valves and other appurtenances shall be based on a lump sum amount named in the Bid Schedule, which price shall constitute full compensation.

2.4 BELOW GRADE 30-INCH PIPING SYSTEM (DUCTILE IRON)—BID ITEM 4

A. Materials: This item includes 30-inch gravity piping system that includes fittings, plug valves and other appurtenances installed below grade from the chlorine contact basin to the new effluent splitter structure as shown on the Plans and specified for the Project.

B. Measurement and Payment: Measurement for payment of the 30-inch gravity piping system installed below grade shall be based upon a linear foot amount, valves and other appurtenances based on lump sum amount.

C. Payment: Payment for the below grade 30-inch gravity piping system shall be based on the linear foot amount, valves and other appurtenances shall be based on a lump sum amount named in the Bid Schedule, which price shall constitute full compensation.

2.5 PROVIDE AND INSTALL PRECAST PARSHALL FLUME VAULT—BID ITEM 5

A. Materials: This item includes providing and installing the pre-cast Parshall flume vault, parshall flume, access hatch and ladder, grating system, piping connections and ultrasonic level transducer system. Payment for this item of work will be full compensation for furnishing all materials, tools, labor, and equipment necessary for installing the lift station. Excavation, bedding and backfill are included in this item.

B. Measurement and Payment: Measurement for payment of the installation of the precast parshall flume vault and all appurtenances shall be based upon a lump sum amount.

C. Payment: Payment for the procuring and installation of the precast parshall flume vault and all appurtenances shall be based on the lump sum amount named in the Bid Schedule, which price shall constitute full compensation.

2.6 BELOW GRADE 8-INCH GRAVITY PIPING (C-900) TO EXISTING RECHARGE BASINS—BID ITEM 6

A. Materials: This item includes 8-inch gravity piping system from the new effluent splitter structure to the existing gravity line serving the existing recharge basins that includes fittings, plug valves and other appurtenances installed below grade as shown on the Plans and specified for the Project. Trenching, bedding, backfill, and pavement replacement are included in this item.

B. Measurement and Payment: Measurement for payment of the below grade 8-inch filter gravity piping system shall be based upon a linear foot amount, valves and other appurtenances based on lump sum amount.

C. Payment: Payment for the below grade 8-inch filter gravity piping system shall be based on the linear foot amount, valves and other appurtenances shall be based on a lump sum amount named in the Bid Schedule, which price shall constitute full compensation.

2.7 SITE WORK—BID ITEM 7

A. Materials: This item includes site work required for this Project and as shown on the Plans including new recharge basin excavation, roadwork, berm work, rough and fine grading, and demolition work.

B. Measurement and Payment: Measurement for payment of the site work shall be based upon a lump sum amount.

C. Payment: Payment for the site work shall be based on the lump sum amount named in the Bid Schedule, which price shall constitute full compensation.

+ + END OF SECTION + +

SECTION 01026

SCHEDULE OF VALUES

PART 1 – GENERAL

1.1 DESCRIPTION

A. The Preliminary Schedule of Values is an itemized list that establishes the value or cost of each major part of the Work and the division of Work between CONTRACTOR and subcontractors.

B. The Preliminary Schedule of Values shall include all items of Work in the Contract Documents.

C. The Schedule of Values is a detailed itemized list that establishes the value or cost of each detailed part of the Work. It and the Progress Schedule updates specified in Section 01310, Progress Schedule, shall be used as the basis for preparing progress payments. The Schedule of Values may be used as a basis for negotiations, concerning additional work or credits, which may arise during the construction. Quantities and unit prices may be included in the schedule, when approved by or required by the OWNER.

D. The Preliminary Schedule of Values and Schedule of Values itemized list of Work, for each major part of the Work and division of Work shall be grouped under the following index areas:
   1. SMCFD Plant No. 1
      a. General Conditions
      b. Site Work (for recharge basins, roads and berms)
      c. Demolition
      d. Provide and install 30-inch DIP effluent from existing chlorine contact basin to new effluent splitter structure
      e. Provide and install 24-inch C905 effluent to new recharge basins and wash from new effluent splitter box
      f. Provide and install 8-inch C900 effluent to existing pipeline serving the existing recharge basins
      g. Provide and install precast effluent splitter structure, gates, piping connections, access hatch and appurtenances
      h. Provide and install precast parshall flume vault complete with parshall flume, piping connections, grating system, ladder system, and ultrasonic level transducer system

1.2 PREPARATION

A. The Schedule of Values:
   1. Preliminary Schedule shall show all Work under the index areas listed in Paragraph 1.1.D.
   2. CONTRACTOR may include an item for bond, insurance, and temporary facilities.
   3. Preliminary Schedule of Values shall be prepared on 8-1/2-inch by 11-inch white paper.
   4. When requested by OWNER, support values with data that will substantiate their correctness.
   5. The sum of the individual values shown on the Schedule of Values shall equal the total Contract Price.
   6. Each item shall include a directly proportional amount of CONTRACTOR'S overhead and profit.

1.3 SUBMITTAL

A. Submit an electronic copy of the Preliminary Schedule of Values to OWNER for review within ten (10) days after the Effective Date of the Agreement.

B. Submit an electronic copy of the final Schedule of Values to OWNER for review within thirty (30) days after the Effective Date of the Agreement.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01046

CONNECTIONS TO EXISTING FACILITIES

PART 1 – GENERAL

1.1 DESCRIPTION

A. Perform all construction necessary to complete connections and tie-ins to existing facilities.

B. Keep existing facilities in operation, unless otherwise specifically permitted in these Specifications or approved by OWNER.

C. CONTRACTOR shall perform all construction activities to avoid interference with the work of others.

1.2 SEQUENCING AND OPERATIONS

A. All operations of existing valves that are required for the Work shall be done by OWNER.

B. Insofar as possible, all equipment shall be tested and in operating condition before the final tie-ins are made to connect equipment to the existing facility.

C. CONTRACTOR shall carefully coordinate all Work and schedules and shall provide OWNER written notice, at least 48 hours, before shut-downs or by-passes are required.

D. Work Sequence: Sequence of Work and Schedule of Completion is specified under Section 01047, Coordination with Owner's Operations.

1.3 SUBMITTAL

A. Submit detailed schedule of proposed connections, including tie-ins.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01047

COORDINATION WITH OWNER'S OPERATIONS

PART 1 - GENERAL

1.1 DESCRIPTION

A. The intent of this Section is to provide CONTRACTOR a sequence to perform the Work in such a manner that continuous, uninterrupted Plant Treatment Processes and all essential Plant services and facilities are maintained operational throughout the construction period.

B. The sequences of Work are specified herein. The sequences have been assembled to maintain plant operations during construction.

C. Except for the shutdown durations specified in this Section, CONTRACTOR'S means and methods shall be implemented such that the existing plant or facility, shall remain in continuous satisfactory operation during the entire construction period. Work shall be so scheduled and conducted by CONTRACTOR such that it shall not impede any treatment process, compromise plant security, create potential hazards to operating equipment and plant personnel, reduce the quality of the plant effluent or cause odor or other nuisances. In performing the Work shown and specified, plan and schedule the Work to meet both the constraints outlined in this Section and plant operating requirements.

D. Work not specifically covered in Section 01010, Summary of Work; or in the following paragraphs may, in general, be done at anytime during normal work hours during the Contract period, subject to the operating requirements outlined in this Section. All references to days in this Section are consecutive calendar days.

E. The CONTRACTOR has the option of providing additional temporary facilities that can eliminate a constraint provided it is done without additional cost to the OWNER, presents no safety hazards, and provided that all requirements of these Specifications are fulfilled.

F. The CONTRACTOR is responsible for coordinating all shutdowns with the OWNER and ENGINEER. Whenever possible, combine discrete shutdown procedures identified in this Section or by CONTRACTOR into a single shutdown when the duration of the shutdowns or the Work requirements allow such combining to occur on a unit process or work area. The intent of combining procedures is to minimize the impacts upon plant operations and processes by limiting the number of shutdowns required.

G. The CONTRACTOR shall not shut-off or disconnect any operating system of the plant, unless approved by the OWNER, in writing. All plant equipment operations and shutdowns shall be executed by the OWNER, unless otherwise noted. Seal OWNER operated gates and valves to prevent unnecessary leakage. After CONTRACTOR'S Work has been completed, remove the seal to the satisfaction of the OWNER.

H. This Section of the Specifications contains several references to equipment, piping, material and appurtenances to be removed or reinstalled. Refer to the Drawings, Section 02050 and other applicable Sections, for definition of the equipment, piping, material and appurtenances

to be removed, turned over to the OWNER and stored on site, or to become the property of CONTRACTOR and removed from the site.

I. The CONTRACTOR is responsible for supplying all temporary pipelines, valves, pumps, meters, spare parts, electrical, controls, any other appurtenances, and labor required for the installation and operation of temporary bypass lines, pumping systems, power or conveyance systems required to maintain operations of the plant during construction activities. All pumps shall be provided with magnetic flowmeters capable of providing a 4 to 20 mADC output signal. Man all pumps continuously (24 hours per day) when in service. Submit to the ENGINEER, for information only, the design for all temporary lines, pumping, or conveyance systems at least seven days prior to the commencement of the Work.

J. Shutdowns that require reduced or cessation of process air flow to the aeration basins, if excessive, will adversely affect the biological process. This may result in reduced treatment capacity for a period of up to several weeks in order for the process to recover. Make every effort to avoid air system shutdowns and, in all cases, complete the Work within the specified shutdown duration. In all cases, shutdowns affecting the air system shall be performed by CONTRACTOR during the lowest flow loading period of the day.

K. Unless otherwise specified, dewater process tanks and pipelines at the beginning of each shutdown. The CONTRACTOR is responsible for washing down and cleaning all tanks, basins, pipelines and other Work areas. Also for the removal of all washdown, cleaning and storm water that accumulates in the Work areas. Approximate depth of sludge, grit and other debris which can be expected to accumulate in the bottom of basins and pipelines is 18-inches. The CONTRACTOR is responsible for removing this material and disposing of off site. Removal of material shall be included as a separate item on CONTRACTOR'S Schedule of Values.

1.2 GENERAL CONSTRAINTS

A. The sequence and shutdown durations are specified, where applicable, for plant units which are to be taken out of service. The operational status of new or existing units other than the designated units shall not be interrupted by CONTRACTOR during the specified time periods. New units may only be used after the specified testing is completed and the units are accepted for use by the ENGINEER, in writing.

B. The following constraints shall be applied to all equipment and appurtenant utility systems on the plant site.
   1. Load limits on Access Roads: Existing and new underground facilities, such as electrical duct banks, pipelines, etc., in, under and crossing plant roads, have been designed for a maximum wheel load of 3,000 pounds The CONTRACTOR shall not exceed this weight limit and shall provide means of protecting the underground facilities.
   2. Access to Plant Site: An unobstructed traffic route through all plant gates shall be maintained at all times.
   3. Safety Barriers: Place safety barriers around unsafe areas located around operational areas accessible to plant Personnel.
   4. Personnel Access: Treatment plant Personnel shall have access to all areas which remain in operation throughout the construction period.
   5. Potable Water System: The existing potable water system shall be kept in operation at all times, unless otherwise specified below.

6. Plumbing Facilities: Sanitary facilities in the existing structures shall be operational at all times for plant Operating Personnel, unless otherwise specified below. All other building plumbing systems, such as roof and floor drains, pumping, etc., shall be maintained for all structures.
7. Storm drainage: Storm drainage on the site shall be operational at all times, unless otherwise specified below.
8. Building Heating and Ventilating: In CONTRACTOR'S Work areas and areas affected by CONTRACTOR'S operations, building heating and ventilating shall be both provided and maintained in structures.
9. Power, Light and Communication Systems: Electric power, lighting service and communication systems shall be maintained in uninterrupted operation in all areas, unless otherwise specified below.
10. Sump Pumps and Sumps: All existing sumps shall be maintained in an operable condition with either existing pumps or temporary pumps provided by CONTRACTOR. Interim piping, power and controls shall be provided by CONTRACTOR, as required by the construction sequence and as directed by the ENGINEER.
11. Seal and Service Water Piping: A supply of service and seal water and the necessary connections to existing equipment shall be maintained during construction, unless otherwise specified below. Interim piping shall be provided by CONTRACTOR, as required.
12. The OWNER will assist CONTRACTOR in dewatering process tanks, basins and other plant process Work areas. It is CONTRACTOR'S responsibility to maintain a clean and dry Work area by pumping and properly disposing of all washdown and cleaning water and stormwater that accumulates in the Work areas.
13. Draining Process Pipes and Conduits:
    a. Unless otherwise specified, the contents of pipes and conduits undergoing modifications shall be transferred to a vactor truck using hoses, piping, pumps, or other applicable means.
    b. If a drain is not available on the pipe to be drained, then a wet tap shall be made by CONTRACTOR using a tapping saddle and valve approved by the ENGINEER. No uncontrolled spillage of a pipe's contents shall be allowed.
    c. Any spillage shall be brought to the ENGINEER'S attention immediately in writing. Wash down any spillage to floor drains, sumps and sump pump discharge piping and then flush out the system to prevent clogging and septic odors. If spillage is not suitable for drainage system, e.g. chemical spills, etc, as determined by the ENGINEER, remove spillage by other method such as Vactor truck, as approved by the ENGINEER.
14. Temporary Partitions and Enclosures: Provide temporary partitions and enclosures necessary to maintain dust-free, heated and ventilated spaces in all areas which are adjacent to his Work and which must be kept operational.
15. Dead End Valves or Pipe: Provide blind flanges on all valves or pipes which dead-end a line on a temporary or permanent basis. Blind flanges shall be braced and blocked, as required or as directed by the ENGINEER in the field.
16. Schedule all start-ups for Monday through Thursday. No start-ups will be allowed on Friday, Saturday, and Sunday.

1.3 SHUTDOWNS

A. General:

1. A shutdown shall be defined as a portion of the normal operation of a plant unit or conduit that has to be suspended or taken out of service in order to perform the specified Work. For each shutdown, compile an inventory of labor and materials required to perform tasks, provide an estimate of the time required (including time for the OWNER to take down and start-up the plant unit or conduit), and a written description of steps required to complete all tasks. The inventory, the estimate, and written procedures shall be submitted to the ENGINEER for review 14 calendar days prior to the proposed start date of the shutdown. Request, in writing from the ENGINEER, approval for each shutdown a minimum of 14 calendar days prior to the proposed shutdown date. No shutdown shall be initiated until the inventory of materials and labor is verified by the ENGINEER on site at least 1 week(s) prior to the proposed start date.
2. The Work required herein and any other Work required by the ENGINEER which may interrupt the normal plant operations shall be accomplished at such times that will be convenient to the OWNER.
3. Have on hand and located in close proximity to the Work area, all tools, equipment, spare parts and materials, both temporary and permanent, necessary to complete each Work category without interruption. Adequate numbers of personnel shall be scheduled for each shutdown, so that the Work shall be accomplished within the specified time frame. Prefabrication of all piping and other assemblies shall be completed, to the greatest degree possible, prior to any shutdowns. The ENGINEER shall be satisfied that CONTRACTOR has complied with these requirements, to the fullest extent possible, before shutdowns will be authorized.
4. If CONTRACTOR'S procedures cause an unscheduled shutdown of the facilities, perform Work as necessary to immediately re-establish satisfactory operation. Notify the ENGINEER, in writing, immediately of any unscheduled shutdown. Permit OWNER'S personnel to work with CONTRACTOR'S personnel, as required, to maintain the plant in continuous satisfactory operation. Unscheduled shutdowns or interruptions of continued safe and satisfactory operation of the facilities that result in fines levied by the U.S. Environmental Protection Agency, Arizona Department of Environmental Quality, Maricopa County Health Department Bureau of Air Pollution Control, or the Maricopa County Department of Environmental Management shall be the responsibility of CONTRACTOR if it is demonstrated that CONTRACTOR was negligent in the Work or did not exercise proper precautions in the conduct of the Work.
5. The scheduled shutdowns during the period of CONTRACTOR'S Work will be as shown in Table 01047-B. All Work requiring the plant to be out-of-service shall be performed during the scheduled shutdowns shown. It should be noted plant staff shall continue to perform administrative, operation and maintenance functions during shutdowns.
6. Electrical Ductbank Installation: Shutdown and relocation of conflicting utilities alignments with electrical ductbank will only be allowed for certain types of process pipelines. Any shutdown and relocations shall follow a strict time schedule in order to minimize impact to plant operations.

B. Shutdowns of Electrical Systems: CONTRACTOR shall lock out and tag circuit breakers and switches operated by the OWNER and shall check cables and wires to be sure that they are de-energized to ground potential before Work begins. Upon completion of the Work, remove the locks and tags and notify the OWNER that the facilities are available for use.

1.4 OVERTIME

A. All overtime Work by CONTRACTOR necessary to conform to the requirements of this Section shall be performed by CONTRACTOR, at no additional cost to the OWNER and shall be performed in accordance with the General Conditions. Make no claims for extra compensation as a result thereof.

1.5 MAINTENANCE OF PLANT OPERATIONS SCHEDULE

A. In order to maintain a continuous plant operation during construction, a Maintenance of Plant Operations (MOPOs) Schedule is included at the end of this Section.

B. Within each MOPO item's procedural steps, time and scheduling constraints and milestone dates may be outlined and are intended to assist CONTRACTOR in developing a sequence of Work and timing in order to maintain continuous operation of the plant.

C. Develop a detailed description of the complete sequence of construction for all the MOPO events contained herein. The sequences shall be submitted to the ENGINEER for review and approval 21 days following the Notice to Proceed.

D. The procedures contained herein were developed based upon available information. This list does not address all required tie-ins, but only those anticipated to be of significant impact to plant operations.

E. Is required to make all tie-ins, connections, and replacements necessary to perform the Work.

F. Is advised that Work in multiple areas of the plant, gravity sewer and force main system shall be performed simultaneously in order to complete the entire scope of the Work within the allotted Contract time.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

TABLE 01047-B

SCHEDULE OF MAJOR SHUTDOWNS DURING CONSTRUCTION PERIOD

SMCFD Plant No. 1 Recharge Facilities Improvements

Area	Equipment	Description	Dates/Duration
Existing Recharge Basin Piping at	Connection of New Splitter Structure Discharge Pipe	The existing reclaimed water distribution piping to the existing recharge basins will require interconnection to the New Splitter Structure. This will require the	Two days

TABLE 01047-B

SCHEDULE OF MAJOR SHUTDOWNS DURING CONSTRUCTION PERIOD

SMCFD Plant No. 1 Recharge Facilities Improvements

Area	Equipment	Description	Dates/Duration
the Chlorine Contact Basin	to Exisiting Recharge Basin Piping	operation of the existing recharge basins to be interupted and the reclaimed water will need to be discharged to the existing wash discharge location at this time. SMCFD will be responsible for operating the appropriate valves to adjust the discharge to the wash only. Contractor shall provide and install the necessary interconnecting piping and appurtenances and test the new piping. This work should be performed after the installation of the New Splitter Structure but before the installation of the new wash and new recharge basin disharge piping. Once this work has been performed and the piping successfully tested the new interconnecting line can be isolated (by closing gate at the New Splitter Structure) and the existing piping can still distribute the flow to the existing recharge basins while the work in the next step is performed.	
Chlorine Contact Basin	Connection of existing 30-inch reclaimed water pipe out of chlorine contact basin to the New Splitter Structure	This work shall occur after: - the above step has been performed, - the piping to the new recharge basins has been installed and connected to the New Splitter Structure - the piping to the new wash discharge location has been installed and connected to the New Splitter Structure - The above piping has been successfully tested The contractor shall isolate the effluent box (after the weir at the end of the chlorine contact basin). This will isolate this box and the 30-inch reclaimed water	Two days

TABLE 01047-B

SCHEDULE OF MAJOR SHUTDOWNS DURING CONSTRUCTION PERIOD

SMCFD Plant No. 1 Recharge Facilities Improvements

Area	Equipment	Description	Dates/Duration
		pipe from the chlorine contact basin. The existing recharge basins will remain operational and in service. The Contractor will install the new 30-inch pipng from the box to the New Splitter Structure and test the piping. After this SMCFD can operate the existing and new piping to new recharge basins and new wash discharge location.	

++ END OF SECTION ++

SECTION 01050

FIELD ENGINEERING

PART 1 – GENERAL

1.1 DESCRIPTION

A. The OWNER will establish a base line for the Project and at least one bench mark for use by CONTRACTOR. The OWNER and CONTRACTOR will coordinate the location of the bench marks and base line to suit the Work.

B. CONTRACTOR shall:
   1. Provide civil, structural and other professional engineering services specified, or required to execute CONTRACTOR'S construction methods.
   2. Develop and make all detail surveys and measurements needed for construction including slope stakes, batter boards, and all other working lines, elevations and cut sheets.
   3. Provide all material required for bench marks, control points, batter boards, grade stakes, structure and pipeline elevation stakes, and other items.
   4. Be solely responsible for all locations, dimensions and levels. No data other than written orders of the OWNER shall justify departure from the dimensions and levels required by the Contract Documents.
   5. Safeguard all points, stakes, grade marks, monuments and bench marks made or established on the Work. Re-establish same with the exception of primary control monuments if disturbed and rectify all Work improperly installed because of not maintaining, not protecting or removing without authorization established points, stakes, marks and monuments.
   6. Provide such facilities as may be necessary for the OWNER to check line and grade points placed by CONTRACTOR.
   7. CONTRACTOR shall give notices and comply with all laws, ordinances, rules and regulations bearing on the conduct of the Work. If CONTRACTOR observes that the Contract Documents are at variance therewith, he shall promptly notify the OWNER, in writing.

1.2 CONTRACTOR'S FIELD ENGINEER

A. CONTRACTOR shall employ and retain at the site of the Work a superintendent with the experience and capability of performing all engineering tasks required of CONTRACTOR. Tasks included are:
   1. Provide weekly reports of Project activity. Reports to be submitted to the OWNER with all pertinent information pertaining to the project as follows:
      a. Major equipment and materials installed.
      e. Major construction equipment utilized.
      f. Location of all areas in which construction was done.
      g. Materials and equipment received.
      h. Work and tests performed.
      i. Weather conditions.
      j. Safety.
      k. Delays.

   2. Check all formwork, reinforcing, inserts, structural steel, bolts, sleeves, piping, other materials and equipment.

3. Maintain field office files and drawings, record drawings, and coordinate engineering services with Subcontractors. Prepare layout and coordination drawings for construction operations.
4. Check and coordinate Work for conflicts and interferences and immediately advise OWNER of all discrepancies noted.
5. Cooperate with OWNER in field inspections, as required.
6. Review and coordinate Shop Drawings and other submittals.

1.3 CONTRACTOR'S SURVEYOR

A. CONTRACTOR shall employ and retain, as needed, at the site of the Work a surveyor with the experience and capability of performing all surveyor and layout tasks required of CONTRACTOR. The surveyor shall be a land surveyor registered in the State of Arizona. Tasks included are:
   1. Provide all surveying equipment required including transit, level, stakes and required surveying accessories.
   2. Furnish all required lines and grades for construction of all facilities, structures, pipelines and site improvements.
   3. Keep professional, accurate, well organized, and legible notes of all measurements and calculations made while surveying and laying out the Work.

B. Primary control survey monuments moved, damaged or destroyed by CONTRACTOR will be reestablished by the OWNER at CONTRACTOR'S expense.

C. CONTRACTOR shall perform such surveys and computations as are necessary to determine quantities of work performed or placed during each progress payment period, and shall perform all surveys necessary for the OWNER to determine final quantities of Work in place.

D. CONTRACTOR shall notify the OWNER at least 24 hours before performing a quantity survey and, unless waived in writing by the OWNER, quantity surveys shall be performed in the presence of the OWNER.

E. From established primary control points, CONTRACTOR shall establish all lines and grades, and elevations necessary to control the Work, and shall be responsible for all measurements that may be required for execution of the Work to the tolerances prescribed in the Contract Documents.

F. CONTRACTOR shall establish, place, and replace as required, such additional stakes, markers, and other controls as may be necessary for control, intermediate checks, and guidance of construction operations.

1.4 SURVEYING

A. CONTRACTOR shall follow the following construction surveying guidelines for this project:
   1. Alignment Staking: Each 50 feet on tangent; each 25 feet on curves.
   2. Slope Staking: Each 50 feet on tangent; each 25 feet on curves; restake every 10 feet in elevation.
   3. Structure: Stake out structures, including elevations; checkouts prior to and during construction.
   4. Pipeline: Stake out pipelines including elevations; checkout prior to and during construction.
   5. Road: Blue tops each 50 feet on tangent and each 25 feet on curves.
   6. Cross-Section: Original, final and intermediate as required, for the structure sites and other locations as necessary for quantity surveys.
   7. Easement Staking: Each 50 feet on tangent; each 25 feet on curves. Also wooden laths with flagging at 100 feet maximum spacing.
   8. Record Staking: Provide permanent stake where blind flanges or caps are provided for future connecting.

B. Temporary survey references set by CONTRACTOR for CONTRACTOR'S own use shall be established to at least second order accuracy (e.g., 1:10000). Construction staking used as a guide for the actual work shall be set at least third order accuracy (e.g., 1:5000). The basis on which such orders are established shall be sufficient to provide the absolute margin for error specified below.

C. The horizontal accuracy of easement staking shall be plus or minus 0.1 feet. The accuracy of all other staking shall be plus or minus 0.04 feet horizontally and plus or minus 0.02 feet vertically.

D. Survey calculations shall include an error analysis sufficient to demonstrate the required accuracy.

E. Survey Records:
   1. Maintain a complete, accurate log of all control and survey Work as it progresses.
   2. All survey data shall be in accordance with recognized professional surveying standards. All original field notes, computations, and other surveying data shall be recorded by CONTRACTORS surveyor in CONTRACTOR furnished hardbound field books, and shall be signed and sealed by CONTRACTOR'S surveyor. The completeness and accuracy of all survey work, and the completeness and accuracy of the survey records, including the field books, shall be the responsibility of CONTRACTOR. Failure to organize and maintain survey records in a professional manner to allow reasonable and independent verification of all calculations by the OWNER, and to allow reasonable identification by the OWNER of all elevations, dimensions, and grades of the Work shall be cause for rejection of the survey records, including the field books.
   3. Illegible notes or data, or erasures on any page of the field books is not acceptable. Copied notes or data shall not be permitted. Corrections by ruling or lining out errors will be satisfactory only if initialed by the surveyor. Violation of the above may require resurveying the data in question at no additional cost to the OWNER.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01091

REFERENCE STANDARDS

PART 1 – GENERAL

1.1 -DESCRIPTION

A. When a reference standard is specified, comply with requirements and recommendations stated in that standard, except when they are modified by the Contract Documents, or when applicable laws, ordinances, rules, regulations or codes establish stricter standards. The latest provisions of applicable standards shall apply to the Work, unless otherwise specified. Reference standards include, but are not necessarily limited to, the following:
   1. American Association of State Highway and Transportation Officials (AASHTO).
   2. American Concrete Institute (ACI).
   3. American Gear Manufacturers Association (AGMA).
   4. American Institute of Steel Construction (AISC).
   5. American Iron and Steel Institute (AISI).
   6. American National Standards Institute (ANSI).
   7. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).
   8. American Society of Mechanical Engineers (ASME).
   9. American Society for Testing and Materials (ASTM).
   10. American Water Works Association (AWWA).
   11. American Welding Society (AWS).
   12. Concrete Reinforcing Steel Institute (CRSI).
   13. Factory Mutual (FM).
   14. Institute of Electrical and Electronics Engineers (IEEE).
   15. National Electrical Manufacturer's Association (NEMA).
   16. Occupational Safety and Health Administration (OSHA).
   17. National Fire Protection Association (NFPA).
   19. National Sanitation Foundation (NSF).
   18. Pre-stressed Concrete Institute (PCI).
   19. Underwriters' Laboratories, Inc. (UL).
   20. All other applicable standards listed in the Specifications and the standards of utility service companies, where applicable.
   21. Maricopa Association of Governments (MAG), Uniform Standard Specifications for Public Works Construction. References to MAG Standard Details refer to the "Uniform Standard Details for Public Works Construction" sponsored and distributed by the Maricopa Association of Governments 1992, Arizona.
   22. Local Construction Code.
   23. American Petroleum Institute (API).

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01092

ABBREVIATIONS AND SYMBOLS

PART 1 - GENERAL

1.1 ABBREVIATIONS

A. Common abbreviations which may be found in the Specifications and Drawings are, but may not be limited to:

		efficiency	eff
acrylonitrile butadiene styrene	ABS	elevation	El.
		ethylene proplylene rubber	EPDM
alternating current	a-c, AC	exhaust fan	EF
American wire gauge	AWG		
ante meridiem	am		
ampere	A, amp	Fahrenheit	OF
average	avg	feet	ft
		feet per hour	fph
biochemical oxygen demand	BOD	feet per minute	fpm
		feet per second	fp s
brake horsepower	bhp	fiberglass reinforced plastic	FRP
British thermal unit	Btu		
		figure	Fig.
Centigrade	8C	flange	flg
chlorinated polyvinyl chloride	CPVC	foot-pound	R-lb
company	Co	gallon	gal
cubic inch	cu in	gallons per hour	gph
cubic foot	cu ft	gallons per minute	gpm
cubic yard	cu yd	gallons per second	gps
cubic feet per minute	cfm	gram	9
cubic feet per second	cfs	ground fault current interrupter	GFCI
decibel	db		
decibels, A-weighted	dBA	hand/off/automatic	HOA
degree Centigrade (or Celsius) (say)	20^{O}C-	heating, ventilation, and air conditioning	HVAC
degree Fahrenheit(say)	68^{O}F	Hertz	Hz
diameter	diam/dia	hour	hr
direct current	d-c	horsepower	hp
dollars	$		
ductile iron	DI	inch	in.
each	ea	inch-pound	in.-lb
		inside diameter	ID
		input/output	I/O
		instrumentation and control	I&C
		parts per million	ppm
		post meridiem	PM

kilovolt	KV
kilovolt-a-mpere	kva
kilowatt	kw
kilowatt-hour	kwhr
length	L
length to least radius of gyration	L/r
light emitting diode	LED
linear	lin
linear foot	lin ft
liter	I
manhole	MH
maximum	max
mean sea level	MSL
mercury	Hg
miles per hour	mph
milli-amp	mA or ma
milliampere DC	ma-dc
milligram	mg
milligrams per liter	mg/l
milliliter	ml
millimeter	mm
million gallon	mil
million gallons per day	mgd
minimum	min
motor control center	MCC
net positive suction head available	NPSHA
net positive suction head required	NPSHR
number	No.
National Pipe Threads	NPT
Operation and Maintenance	O&M
ounce	oz
outside diameter	OD
variable frequency drive	VFD
volt	v
volts alternating current	VAC
volts direct current	VDC
water to cement	W/C
water column	W.C.
plus or minus	±
polytetrafluorethylene	PTFE
polyvinyl chloride	PVC
pound	lb
pounds per square foot	psf
pounds per square inch	psi
pounds per square inch absolute	psia
pounds per square inch gage	psig
Process and Instrumentation Diagrams	P&ID
random access memory	RAM
reinforced concrete pipe	RCP
reinforced concrete cylinder pipe	RCCP
relative humidity	RH
revolutions per minute	rpm
second	sec
speciflc gravity	SP gr
square foot	sq ft
square inch	sq in
square yard	sq yd
stainless steel	Ss
standard	std
standard cubic feet per minute	scfm
symmetrical	sym.
total dynamic head	TDH
totally-enclosed, fan-cooled	TEFC
totally-enclosed, non-ventilated	TENV
twisted shielded	TWSH
ultraviolet	UV
United States	US

1.2 ORGANIZATION ABBREVIATIONS

A. Abbreviations of organizations used in these Specifications are:

1.	AA	Aluminum Association
2.	AASHTO	American Association of State Highway and Transportation
3.	ACI	American Concrete Institute
4.	ACS	American Chemical Society
5.	AFBNLA	Anit-Friction Bearing Manufacturer's Association
6.	AICHE	American Institute of Chemical Engineers
7.	ADAA	Acoustical and Insulating Materials Association
8.	AISC	American institute of Steel Construction
9.	AISI	American Iron and Steel Institute
10.	AGMA	American Gear Manufacturers Association
11.	ANSI	American National Standards Institute
12.	APHA	American Public Health Association
13.	API	American Petroleum institute
14.	AREA	American Railway Engineering Association
15.	ASA	American Standards Association
16.	ASCE	American Society of Civil Engineers
17.	ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
18.	ASME	American Society of Mechanical Engineers
19.	ASTM	American Society for Testing and Materials
20.	AWPB	American Wood Preservers Bureau
21.	AWS	American Welding Society
22.	AWWA	American Water Works Association
23.	CRSI	Concrete Reinforcing Steel Institute
24.	DIPRA	Ductile Iron Pipe Research Association
25.	EPA	Environmental Protection Agency
26.	FM	Factory Mutual
27.	HEW	Department of Health, Education and Welfare
28.	IRM	Department of Housing and urban Development
29.	IEEE	Institute of Electrical and Electronic Engineers
30.	IPCEA	Insulated Power Cable Engineers Association
31.	IRI	Industrial Risk Insurance
32.	ISA	Instrument Society of America
33.	ISO	Insurance Services Office
34.	IEEE	Institute of Electrical and Electronic Engineers
35.	IPCEA	Insulated Power Cable Engineers Association
36.	JIC	Joint Industrial Council
37.	MAG	Maricopa Association of Governments
38.	NAAMM	National Association of Architectural Metal Manufacturers
39.	NARUC	National Association of Railroad and Utilities Commissioners
40.	NBS	National Bureau of Standards
41.	NEC	National Electric Code
42.	NEMA	National Electrical Manufacturers Association
43.	NFPA	National Fire Protection Association
44.	NSF	National Sanitation Foundation
45.	NWMA	National Woodworkers Manufacturers Association
46.	OSHA	Occupational Safety and Health Administration
47.	PCI	Precast Concrete Institute

48.	SDI	Steel Door Institute
49.	SMACNA	Sheet Metal and Air Conditioning National Association
50.	SSPC	Steel Structures Painting Council
51.	SSPWC	Standard Specifications for Public Works Construction
52.	UL	Underwriters' Laboratories, Inc.
53.	USGS	United States Geological Survey
54.	USPHS	United States Public Health Service
55.	WEF	Water Environment Federation
56.	WPCF	Water Pollution Control Federation
57.	WWENIA	Water and Wastewater Equipment Manufacturers Association

1.3 SYMBOL

A. Refer to Drawings for symbols used on the Drawings.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01103

EARTHMOVING AND DUST CONTROL

PART 1 - GENERAL

1.1 DESCRIPTION

A. CONTRACTOR shall obtain all earthmoving permits and any other permits required for earthmoving and dust generating operations related to the Work as required by the Pinal County Air Pollution Control Regulations.

B. CONTRACTOR shall not cause or allow any dust generating operation, earthmoving operation, use of property, or any other operation which causes fugitive dust emissions that exceed the local authority's requirements.

C. If requested by the OWNER, local authority having jurisdiction, CONTRACTOR shall conduct opacity observations for visible emissions of fugitive dust in accordance with techniques specified in USEPA Reference Method 9, with no additional cost to the OWNER.

D. In addition to earthmoving permits, CONTRACTOR shall obtain an approved Dust Control Plan from local authority having jurisdiction, as applicable. At a minimum, the Dust Control Plan shall include the following information:
   1. Name(s), addressees) and phone number(s) of the person(s) responsible for the preparation, submittal, and implementation of the Dust Control Plan and responsible for the dust generating operations.
   2. A site plan that describes the total area of land surface to be disturbed (in acres); the operations and activities to be performed on the site; actual and potential sources of fugitive dust emissions; and the delivery, transportation, and storage areas for the site (including types of materials stored and appropriate size of material stock piles).
   3. Description of the reasonably available control measures.
   4. Description of dust suppressants to be applied including product specifications; method, frequency, and intensity of application; type, number, and capacity of application equipment; and certifications related to the suppressant's appropriate and safe use.
   5. Description of specific surface treatment(s) and control methods used to control material track-out where unpaved and access points join paved surfaces.
   6. Description of at least one alternative RACM for each actual and potential fugitive dust source shall be designated as a contingency measure.

E. CONTRACTOR shall post a copy of all earthmoving permits as well as the approved Dust Control Plan in a conspicuous location at the worksite.

F. CONTRACTOR shall maintain a daily written log that records the actual application or implementation of the RACMs described in the approved Dust Control Plan. CONTRACTOR shall maintain this written log and supporting documentation on site and shall make available for review on request by OWNER, or Pinal County representative. CONTRACTOR shall retain copies of the Dust Control Plan, RACM implementation records, and all supporting documentation for a minimum of three (3) years.

G. CONTRACTOR, at a minimum, shall provide all necessary equipment and materials to apply sufficient dust suppressants (e.g., water, etc.), properly clean (sweep, etc.) all track-out areas, and provide adequate physical stabilizations (e.g., gravel, recycled asphalt, etc.) to meet all requirements of the earthmoving permit and approved Dust Control Plan. CONTRACTOR shall use these methods to control fugitive dust generation from all CONTRACTOR operations on all CONTRACTOR areas including, but not limited to:
   1. Construction areas.
   2. Vehicle and equipment parking areas.
   3. Material storage areas.
   4. Office and trailer areas.
   5. Haul and access roadways.
   6. Track-out areas.
   7. All other areas where CONTRACTOR shall be working, storing, or parking vehicles, equipment, and materials.

H. CONTRACTOR shall pay all fines issued to the OWNER by the USEPA, ADEQ, and local authority having jurisdiction due to violation of CONTRACTOR'S earthmoving permit and Dust Control Plan.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01104

STORMWATER POLLUTION PREVENTION PLAN AND PERMIT

PART 1 - GENERAL

1.1 DESCRIPTION

A. CONTRACTOR shall be responsible for providing necessary materials and for taking appropriate measures to minimize pollutants in stormwater runoff from the Site.

B. The Contract Price shall include all material, labor and other permits and incidental costs related to:
   1. Preparing, updating and revising the Stormwater Construction Pollution Prevention Plan (SWPPP) and the NPDES General Permit for Stormwater Discharge.
   2. Installing and maintaining all structural and non-structural items chosen by CONTRACTOR to comply with the construction SWPPP.
   3. Clean-up and disposal costs associated with clean-up and repair following storm events or CONTRACTOR caused spills on the Project.
   4. Implementing and maintaining Best Management Practices to comply with the OWNER'S stormwater code.
   5. Preparing the Notice of Intent and Notice of Termination

C. CONTRACTOR shall coordinate the requirements under this Section with Section 02200, Excavation and Backfill, permit requirements. All necessary SWPP controls and practices must be implemented prior to commencement of any construction activity.

1.2 SUBMITTAL

A. CONTRACTOR shall submit, at least two (2) days prior to the initial start of construction on the Project, completed, signed Notice of Intent Form to the State of Arizona at the following address:

   1. Arizona Department of Environmental Quality
      Water Permit Section/Stormwater NOI (5415B-3)
      1110 W. Washington Street
      Phoenix, AZ 85007

      fax: (602) 771-4674

B. CONTRACTOR shall submit to the OWNER, no later than ten (10) days before submitting to State and Federal agencies the following:
   1. Notice of Intent (NOI).
   2. SWPPP for the Project, including certification of signature. Stormwater Plan shall include CONTRACTOR'S proposed temporary means for stormwater control during all phases of construction and include stormwater pumping/retention plans. This submittal shall be coordinated with CONTRACTOR'S Excavation Plan submittal, specified in Section 02200, Excavation and Backfill.

C. CONTRACTOR shall submit to the OWNER, as part of the Construction SWPPP a construction site inspection report that includes the following:
   1. Inspection scope.
   2. Inspector qualifications.
   3. Observations of SWPPP non-compliance and corrective steps taken.
   4. Certificate of Compliance with SWPPP and the NPDES General Permit for Stormwater Discharge in the event of no incidents. Reports shall be submitted each quarter, at a minimum, throughout the Contract duration.

D. CONTRACTOR shall submit to the OWNER, upon project completion the Notice of Termination (NOT) of coverage under NPDES General Permit.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01300

SUBMITTALS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Submittal of documents described in the General Conditions, Supplemental Conditions and hereinafter are required prior to, during and at the end of the construction period. The submittal shall conform to the requirements described in this Section and all referenced Sections or Articles.

1.2 PROCEDURE

A. Submittal within ten (10) days after the effective date of the Agreement or at the Pre-Construction meeting, whichever occurs first: Location of information concerning each submittal is referenced and a copy of each required form is included with this Section.
   1. Preliminary Schedule of Shop Drawings.
   2. Preliminary Progress Schedule: Prepare and submit in accordance with Section 01310, Progress Schedule.

B. Submittal Prior to Beginning the Work: See the General Conditions and Supplementary Conditions of the Contract Documents.

C. Submittal during Construction: During progress of the construction, make the following submittal in a timely manner to prevent any delay in the Work schedule:
   1. Updates to Progress Schedule: Provide an assessment of Work progress in relation to the Progress Schedule in accordance with Section 01310, Progress Schedule.
   2. Shop Drawings, Product Data and Samples: Submit Shop Drawings, product data and samples in accordance with Section 01340, Shop Drawing Procedures, and as required in various Sections of the Technical Specifications.
   3. Submittal Schedule: Shown in this Section. Submit an updated Shop Drawing, Product Data and Sample Submittal Schedule with each Progress Payment Request. Updated Submittal and Progress Schedules shall be submitted with each month's Progress Payment Request.

D. Submittal at Interim Completion: Submit all Operations and Maintenance Data for each item of Work commissioned into operation at each interim completion date.

SHOP DRAWINGS, PRODUCT DATA AND SAMPLE

SUBMITTAL SCHEDULE

CONTRACTOR:_____
Project Name:_____
Project No.:_____ Date _____ Page ____ of ____

Item No.	Description	Specification Section Number	Date To Be Submitted	Approval Needed By	Date Submitted	Date Reviewed	Transmittal Number

Request for Information

CONTRACTOR _____ RFI# _____
Requested By _____ Directed to _____
Subject _____ Date Received _____
Spec. Section _____ Date Transmitted _____
Drawing References _____ Date Reply Received _____
Date Reply Needed _____ Date Reply Transmitted _____

INFORMATION NEEDED:

_____ _____
Date Signature

REPLY:

_____ _____
Date Signature

CONTRACTOR_____

_____

_____

CONTRACTORS DAILY CONSTRUCTION REPORT

Project No.

Project Name _____

Project No. _____ Report No. _____ Date _____

CONTRACTORS WORK FORCE:		SUBCONTRACTORS WORK FORCE:		EQUIPMENT ON SITE:	In Use	Not in Use
Administrative	_____	Mechanical	_____	Cranes	____	____
Supervisors	_____	Electrical	_____	Loaders	____	____
Carpenters	_____	Instrumentation	_____	Dozers	____	____
Iron Workers	_____	Sitework	_____	Scrapers	____	____
Operators	_____	Masonry	_____	Compactors	____	____
Finishers	_____	Roofing	_____	Compressors	____	____
Welders	_____	Rebar	_____	Welders	____	____
Electricians	_____	Foundation	_____	Graders	____	____
Laborers	_____	Painting	_____	Trucks	____	____
_____	_____	_____	_____	Backhoe	____	____
_____	_____	_____	_____			
_____	_____	_____	_____			

Work Performed: _____

_____

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Material and Equipment Delivered: _____

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Remarks: _____

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_____

By: _____

Title: _____

+ + END OF SECTION + +

SECTION 01310

PROGRESS SCHEDULE

PART 1 – GENERAL

1.1 DESCRIPTION

A. This Section describes the Progress Schedule requirements to ensure that interim milestone dates will be met and completion of the Work will be accomplished within the time established. OWNER'S opinions concerning the various scheduling documents and reports are not controlling CONTRACTOR'S independent judgement concerning means, methods, and sequences of construction CONTRACTOR employs. CONTRACTOR is solely responsible for meeting the Contract time(s) given in these Contract Documents.

B. No later than ten (10) calendar days after the effective date of the Agreement, CONTRACTOR shall submit a Preliminary Progress Schedule. The Preliminary Progress Schedule shall be referenced to time.

C. No later than thirty (30) calendar days after the effective date of the Agreement, CONTRACTOR shall submit to the OWNER a 90-day Bar Chart Schedule prepared in accordance with Paragraph 1.7 herein. The 90-day Bar Chart Schedule shall detail the first 90 calendar days of the Project, and progress payments for the first 90 calendar days shall be made only on the basis of earned revenue generated by updates of the 90-day Bar Chart Schedule. No payments for progress or mobilization will be paid to CONTRACTOR until the 90-day Bar Chart Schedule is submitted and approved.

D. No later than sixty (60) calendar days after the effective date of the Agreement, CONTRACTOR shall submit to the OWNER a full Progress Schedule prepared in accordance with Paragraphs 1.1 through 1.6 herein. No additional payments for progress will be paid to CONTRACTOR, other than those described in Paragraph 1.1.C, until the full Progress Schedule is submitted and approved.

1.2 LOGIC DIAGRAM

A. CONTRACTOR shall prepare and submit a complete reproducible set of pure logic diagrams. The logic diagrams shall be grouped by Area and show the order and interdependence of activities and the sequence and quantities in which the Work is to be accomplished. Interrelationships to or from activities outside the area shown will be depicted. The basic concept of Precedence Diagraming Method (PDM) network scheduling shall be followed to show how the start of a given activity is dependent on the, completion of preceding activities and how its completion may affect the start of following activities. The level of schedule detail shall define the week to week activities of the construction Work.

B. The critical path shall be distinguished from other paths on the network. The logic diagrams shall be banded by major work systems, including one (1) system for procurement and by specific area within each system. Logic diagrams shall include the following:
   1. Activity number.
   2. Activity description.

3. Activity duration (work days).
4. Critical path denoted.
5. Slack or float of each activity.

C. In addition to construction activities, network activities shall include the submittal and approval of samples of materials, shop and working drawings, and fabrication of special materials. It shall include all documents and proofs of compliance required by the Contract Documents for Final Inspection and Acceptance of the Work.

D. All activities of the OWNER that affect progress and special dates required by the Contract shall be shown.

1.3 FAILURE TO SUBMIT

A. Should CONTRACTOR fail to submit the Progress Schedule in the form indicated within the required time frames, the processing of progress payments will not be possible. No payments of any kind will be made to CONTRACTOR until he is in compliance with the Progress Schedule submittal requirements described hereinbefore and it can be used to generate earned revenue reports.

1.4 UPDATING THE PROGRESS SCHEDULE

A. Updates:
   1. CONTRACTOR shall update the mathematical tabulation on a monthly basis and/or prior to scheduled construction progress meetings.
   2. CONTRACTOR shall provide the OWNER'S REPRESENTATIVE with an electronic PDF copy. Network diagrams shall be submitted with the tabulation if there are any proposed revisions to network logic, interim milestones, or contract completion. The updated tabulations shall reflect the current status of activities, as outlined on the baseline network diagram. The updated tabulation reports shall reflect all changes in dates, remaining durations, and float time. If any delays have occurred, these shall be noted for time consideration. The processing of progress payments cannot proceed until the Schedule Update is received, reviewed and approved.

C. Network Revisions:
   1. Conditions may develop that require revisions to logic or durations of the original network. If during the progress of the Work events develop that necessitate changes in the original Progress Schedule, CONTRACTOR shall propose such changes so as to depict the current mode of operation and shall provide the OWNER'S REPRESENTATIVE with a revised network diagram. Any revision to the original logic and/or original durations must be approved by the OWNER'S REPRESENTATIVE. After approval, logic/duration revisions will be incorporated into the Progress Schedule and will be addressed in the monthly narrative report by means of both a description of the revisions and a listing of those network elements affected by such change. All changes resulting from Change Order(s), additions and/or deletions, will be fully incorporated into the Progress Schedule on the first update after the Change Order approval including all adjustments to the Contract price.
   2. Revisions and additions to the approved network diagrams shall be submitted electronically in PDF format to the OWNER'S REPRESENTATIVE.
   3. The list of revisions and additions will include the following when applicable:
      a. Addition and deletion of activities.

b. Addition and deletion of relationships.
c. Changes to activity descriptions and durations.
d. Changes to relationship types and lag codes.
e. Changes to contract milestone dates and approved constraint dates.
f. Changes to dollar values resulting from approved Change Orders.
g. All other revisions to the network logic.

1.5 TIME IMPACT ANALYSIS FOR CHANGE ORDERS, DELAYS, AND TIME EXTENSIONS

A. Change Orders, Delays, and Time Extensions:
   1. When a Change Order(s) is (are) proposed by the OWNER'S REPRESENTATIVE or CONTRACTOR, or delays are experienced, CONTRACTOR shall submit a Time Impact Analysis (TIA) illustrating the influence of each Change Order or delay on any specified intermediate milestone date(s) and/or contract completion date. Each TIA shall include a sketch (fragment) demonstrating how CONTRACTOR proposes to incorporate the change(s) or delay(s) into the current Progress Schedule. The fragment will include all logic changes and additions required as a result of said Change Order(s) and/or delay(s).
   2. This fragment will show all CPM Logic revisions for the Work in question and its relationship to other activities in the network plan. Additionally, the analysis shall demonstrate the time impact, based on the date the change was given to CONTRACTOR, the status of construction at that point in time, and the activity duration of all affected activities. The activity duration used in this analysis shall be those included in the latest update of the Progress Schedule, closest to the time of delay as adjusted by mutual agreement in writing.

B. Submission:
   1. Each Time Impact Analysis shall be submitted within twenty (20) calendar days after a delay occurs or a notice of change or Change Order is given to CONTRACTOR. In cases where CONTRACTOR does not submit a Time Impact Analysis for a specific change or delay within the specified period of time, it shall be mutually agreed that no time extension is required.

C. Evaluation:
   1. Final evaluation of each Time Impact Analysis by the OWNER'S REPRESENTATIVE shall be made within fourteen (14) calendar days after receipt, unless subsequent meetings and negotiations are necessary. Adjustments in the Contract time for performance shall be made only by written Change Order. Upon approval by the OWNER'S REPRESENTATIVE, fragments illustrating the influence of changes and delays shall be incorporated into the current schedule by CONTRACTOR during the first update after agreement is reached.
   2. The time difference between the Early Finish date and the Late Finish date is defined as "float." The "float" belongs to the Project and may be used by CONTRACTOR or the OWNER to benefit the Project. Changes or delays that influence activities in the network with "float" and do not extend the Critical Path (the sequence of activities with zero days float) shall not be justification for an extension of Contract time for performance.

1.6 RECOVERY SCHEDULE

A. In the event that the schedule update mathematical analysis indicates that the project, or progress towards any interim milestone requirement, falls fifteen (15) or more work days behind schedule and there is no excusable delay or change to support a time extension, CONTRACTOR shall prepare and submit a Recovery Schedule for approval by the OWNER'S REPRESENTATIVE.

CONTRACTOR shall revise logic and/or durations to cause the mathematical analysis to show the Project on schedule. The Recovery Schedule shall be submitted fourteen (14) calendar days after the Schedule Update is submitted.

B. CONTRACTOR shall provide additional manpower, equipment, or materials or work additional shifts, or expedite procurement to complete activities within the approved intermediate or Contract completion dates, at no additional cost the OWNER. Upon approval of the Recovery Schedule by the OWNER'S REPRESENTATIVE, CONTRACTOR shall incorporate the Recovery Schedule into the current schedule.

C. Lack of Action:
   1. CONTRACTOR'S refusal, failure, or neglect to take appropriate recovery action or to submit a written recovery statement shall constitute reasonable evidence that CONTRACTOR is not prosecuting the Work, or separable part, with the diligence that will ensure its completion within the applicable Contract time. Such lack of action shall constitute sufficient basis for the OWNER'S REPRESENTATIVE to recommend the withholding of some or all of any payment due, and/or shall be considered grounds for termination by the OWNER.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01340

SHOP DRAWING PROCEDURES

PART 1 - GENERAL

1.1 DESCRIPTION

A. The submittal of Shop Drawings shall conform to requirements of General Conditions and procedures described in this Section. A separate transmittal form shall be used for each specific item or class of material or equipment for which a submittal is required. Transmittal of Shop Drawings on various items using a single transmittal form shall be permitted only when the items taken together constitute a manufacturer's "package" or are so functionally related that expediency indicates review of the group or package as a whole.

B. The term "Shop Drawings" as used herein shall be understood to include detailed design calculations, fabrication and installation drawings, lists, graphs, test data, operating instructions, and other items which shall include, but not are necessarily limited to:

1. Drawings and/or catalog information and cuts.
2. Specifications, parts list, suggested spare parts lists, and equipment drawings.
3. Wiring diagrams of systems and equipment.
4. Complete lubrication, maintenance and operation instructions, including initial startup instructions as described in Section 01730, Instruction of Operations and Maintenance Personnel.
5. Applicable certifications.
6. Anchor bolt templates, mounting instructions and mounting design calculations as required.
7. Required maintenance operations to allow all installed equipment to remain idle for a period of time not to exceed 24 months.
8. Other technical, installation, and maintenance data as applicable.
9. Unloading and handling methods and storage requirements.
10. Note, highlight, and explain proposed changes to the Contract Documents.
11. Paint submittal showing type of paint and the mils thickness of coating system used. The coating system shall be the approved system as submitted under Division 9, Finishes.
12. Drawings showing CONTRACTOR field verifications illustrating all field dimensions. CONTRACTOR shall field verify all dimensions and existing materials shown on the Drawings. Any modifications required shall be at CONTRACTOR'S expense.

C. Submittal Schedule: CONTRACTOR, within ten (10) days after the effective date of the Agreement or by the Pre-Construction Meeting whichever comes first, shall prepare and submit to the OWNER & ENGINEER a comprehensive Submittal Schedule. CONTRACTOR shall identify on his Submittal Schedule all of the submittal items required by the Contract Documents governing his Work. CONTRACTOR shall indicate, for each submittal item on his Submittal Schedule the following:

1. The date by which that item will be submitted to the OWNER'S REPRESENTATIVE.

2. Whether the submittal is for a substitute or "equal" item. Complete submittal for all substitute or "equal" items shall be made to the OWNER'S REPRESENTATIVE, in accordance with the Contract requirements. Identification by the CONTRACTOR of substitute or "equal" items does not relieve CONTRACTOR of his responsibility to furnish equipment and materials that meet all the requirements of the Contract Documents. Items of manufacturers' equipment listed with CONTRACTOR'S Bid Proposal shall not be replaced with any substitute or "equal" items as part of this submittal schedule process. Procedure for substitutions is specified under the General Conditions, Standard General Conditions of the Construction Contract.
3. Whether the submittal is for review or for record only.
4. The date by which response is required.
5. The date by which the material or equipment must be on site in order not to delay the progress of the Work.

D. In preparing his Submittal Schedule, CONTRACTOR shall consider the nature and complexity of each submittal item and shall allow ample time for review, revision or correction. Submittal will normally be returned to CONTRACTOR within 15 calendar days following receipt of the submittal. Complex submittal, for example, Instrumentation and Control Systems, Variable Frequency Drives and other such submittal may require additional review time. CONTRACTOR shall identify submittal for which he anticipates long review periods.

E. The OWNER'S REPRESENTATIVE will review CONTRACTOR'S Submittal Schedule to determine its completeness and compatibility with the Progress Schedule. A Submittal Schedule which is incompatible with the Progress Schedule or a review schedule which places extraordinary manpower demands on the OWNER'S REPRESENTATIVE will be sufficient reason(s) to reject the Submittal Schedule.

F. CONTRACTOR'S Submittal Schedule shall be consistent with the Progress Schedule as described in Section 01310, Progress Schedule.

G. Approval of the Submittal Schedule shall be required prior to processing of the first progress payment.

1.2 PROCEDURE

A. Submit Shop Drawings to: Teresa Valentine, P.E., Valentine Environmental Engineers, LLC. 15845 S. 46th Street, Suite 144 Phoenix Arizona, 85048. Submittals can be also be submitted electronically to tvalentine@valentineengineers.com.

B. All submittals will be submitted to ENGINEER and the ENGINEER will forward to the OWNER'S REPRESENTATIVE. The ENGINEER will combine review comments before sending back to the CONTRACTOR.

C. A letter of transmittal shall accompany each submittal. If data for more than one Section of the Specifications is submitted, a separate transmittal letter shall accompany the data submitted for each Section.

D. All letters of transmittal shall be submitted in duplicate.

E. At the beginning of each letter of transmittal, provide a reference heading indicating the following:
   1. Owner's Name
   2. Project Name
   3. Contract No.
   4. Transmittal No.
   5. Section No.

F. If a Shop Drawing deviates from the requirements of the Contract Documents, CONTRACTOR shall specifically note each variation in his letter of transmittal.

G. All Shop Drawings submitted for approval shall have a title block with complete identifying Information satisfactory to OWNER.

H. All Shop Drawings submitted shall bear the stamp of approval and signature of CONTRACTOR as evidence that they have been reviewed by CONTRACTOR. Submittal without this stamp of approval will not be reviewed by OWNER'S REPRESENTATIVE and will be returned to CONTRACTOR. CONTRACTOR'S stamp shall contain the following minimum information:

Project Name: _____
CONTRACTOR'S Name: _____
Date: _____
Reference _____
Item: _____
Specifications: _____
Section: _____
Page No.: _____
Para. No.: _____
Drawing No. _____ of _____
Location: _____
Submittal No.: _____
Approved By: _____

I. A number shall be assigned to each submittal by CONTRACTOR starting with No. 1 and thence numbered consecutively. Resubmittals shall be identified by the original submittal number followed by the suffix "A" for the first resubmittal, the suffix "B" for the second resubmittal, etc.

J. CONTRACTOR shall initially submit to ENGINEER a minimum of three (3) copies of each submittal and resubmittal. Electronic submittals will be allowed, if desired.

K. After ENGINEER & OWNER'S REPRESENTATIVE completes their review, Shop Drawings will be affixed with a stamp and marked with one of the following notations:
   1. Approved
   2. Approved as Noted
   3. Revise and Resubmit
   4. Not Approved

L. If a submittal is acceptable, it will be marked "Approved" or "Approved as Noted". Up to one copy of the approved submittal will be returned to CONTRACTOR. The

OWNER'S REPRESENTATIVE & ENGINEER will be furnished with one copy each of the approved Shop Drawings.

M. Upon return of a submittal marked "Approved" or "Approved as Noted", CONTRACTOR may order, ship or fabricate the materials included on the submittal, provided it is in accordance with the corrections indicated.

N. If a Shop Drawing marked "Approved as Noted" has extensive corrections or corrections affecting other Drawings or Work, OWNER'S REPRESENTATIVE may require that CONTRACTOR make the corrections indicated thereon and resubmit the Shop Drawings for record purposes. Such Drawings will have the notation, "Approved as Noted - Resubmit." The corrected Shop Drawing shall be a pre-condition for payment for the work item of the Shop Drawing.

O. If a submittal is unacceptable, one copy will be returned to CONTRACTOR with one of the following notations:
1. "Revise and Resubmit"
2. "Not Approved"

P. Upon return of a submittal marked "Revise and Resubmit", CONTRACTOR shall make the corrections indicated and repeat the initial approval procedure. The "Not Approved" notation is used to indicate material and/or equipment that is not acceptable. Upon return of a submittal so marked, CONTRACTOR shall repeat the initial approval procedure utilizing acceptable material and/or equipment.

Q. Any related Work performed or equipment installed without an "Approved" or "Approved as Noted" Shop Drawing will be at the sole responsibility of CONTRACTOR.

R. Shop Drawings shall be submitted well in advance of the need for the material or equipment for construction and with ample allowance for the time required to make delivery of material or equipment after data covering such is approved. CONTRACTOR shall assume the risk for all materials or equipment which are fabricated or delivered prior to the approval of Shop Drawings. Materials or equipment will not be included in periodic progress payments until approval thereof has been obtained in the specified manner.

S. ENGINEER & OWNER will review and process all submittal promptly; a reason-able time shall be allowed for this, for the Shop Drawings being revised and resubmitted, and for time required to return the approved Shop Drawings to CONTRACTOR.

T. It is CONTRACTOR'S responsibility to review submittal made by his suppliers and Subcontractors before transmitting them to ENGINEER to assure proper coordination of the Work and to determine that each submittal is in accordance with his desires and that there is sufficient information about materials and equipment for OWNER'S REPRESENTATIVE & ENGINEER to determine compliance with the Contract Documents. Incomplete or inadequate submittals will be returned for revision without review.

U. The OWNER'S REPRESENTATIVE reserves the right to withhold monies, up to the limit identified in the General Conditions, for shop drawing reviews beyond those described herein.

V. The OWNER'S REPRESENTATIVE will implement, if requested by CONTRACTOR, special Shop Drawing Review Meetings. The purpose of these meetings is to expedite shop drawing reviews for the equipment and materials required for the first document of the Work. Requirements of this Section will not be waived but could be expedited.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (N0T USED)

+ + END OF SECTION + +

SECTION 01410

TESTING LABORATORY SERVICES

PART 1 – GENERAL

1.1 DESCRIPTION

A. The CONTRACTOR will employ and pay for an independent testing laboratory to perform the specified services.

B. Inspection, sampling and testing shall be as specified in the individual Sections. These include:
   1. Section 02220, Excavation and Backfill.

C. The OWNER will pay for the testing listed above, except for repeat testing which results from CONTRACTOR'S negligence or his repeated failure to meet Contract Document requirements.

D. CONTRACTOR shall pay for:
   1. Tests not listed above.
   2. Tests made for CONTRACTOR'S convenience.
   3. Repeat tests required because of CONTRACTOR'S negligence or repeated failure, three (3) or more tests for the same item, to meet Contract Document requirements.

E. The testing laboratory is not authorized to approve or accept any portion of the Work; rescind, alter or augment the requirements of the Contract Documents; or perform any duties of CONTRACTOR.

1.2 QUALIFICATIONS OF LABORATORY

A. Where applicable, the testing laboratory will meet "Recommended Requirements for Independent Laboratory Qualification", latest edition, published by American Council of Independent Laboratories and the basic requirements of ASTM E 329 "Standards of Recommended Practice for Inspection and Testing Agencies for Concrete and Steel as Used in Construction".

B. Testing equipment used by the laboratory will be calibrated at maximum twelve (12) month intervals by devices of accuracy traceable to either National Bureau of Standards or accepted values of natural physical constants.

1.3 LABORATORY DUTIES

A. The testing laboratory shall:

   1. Cooperate with CONTRACTOR and provide qualified personnel promptly on notice.
   2. Perform specified inspections, sampling and testing of materials and methods of construction; comply with applicable standards; and ascertain Compliance with the requirements of the Contract Documents.
   3. Promptly notify OWNER and CONTRACTOR of irregularities or deficiencies of Work observed during performance of services.
   4. Promptly submit five (5) copies of reports of inspections and tests to OWNER, including:
      a. Date issued.
      b. Project title and number.

c. Testing laboratory name and address.
d. Date of inspection or sampling.
e. Record of temperature and weather.
f. Date of test.
g. Identification of product and Specification Section.
h. Location in Project.
i. Type of inspection or test.
j. Results of tests and observations regarding compliance with Contract Documents.

5. Perform additional tests and services, as required by OWNER.

1.4 CONTRACTOR'S RESPONSIBILITIES

A. CONTRACTOR shall:
1. Cooperate with laboratory personnel and provide access to Work and to manufacturer's operations.
2. Provide to laboratory, preliminary representative samples of materials to be tested, in required quantities.
3. Furnish copies of product test reports.
4. Provide to the laboratory the preliminary design mix proposed for concrete and other material mixes that require testing by the testing laboratory.
5. Furnish labor and facilities:
   a. To provide access to Work to be tested.
   b. To obtain and handle samples at the site.
   c. To facilitate inspections and tests.
   d. For laboratory's exclusive use for storage and curing of test samples.
   e. Forms for preparing concrete test beams and cylinders.
6. Notify laboratory and OWNER sufficiently in advance of operations to allow for assignment of personnel and scheduling of tests.
7. Arrange with laboratory and pay for additional samples and tests required for CONTRACTOR'S convenience.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXCUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01453

TESTING OF HYDRAULIC STRUCTURES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, material, tools, equipment and incidentals as shown, specified and required to clean, flush and test structures.
   2. The Work also shall include all labor and materials required to prepare a structure for testing, convey water to the testing location, perform the testing, and all labor and materials required to drain and dispose of water used for testing.

B. Hydraulic Structures Scheduled for Hydrostatic Testing: Clean and test the following structures:

Hydraulic Structure Number	Hydraulic Structure Service
1. Effluent Box of Existing Chlorine Contact Basin	Conveyance
2. New Reclaimed Water Splitter Structure	Conveyance

C. Water for Testing:
   1. Water for initial testing will be furnished by the OWNER.
   2. CONTRACTOR shall provide all temporary piping, hose, valves, backflow preventors (if required), appurtenances, and services required for testing.
   3. CONTRACTOR shall convey the water to the testing location.
   4. Water supply for testing will be determined by the OWNER.
   5. The maximum rate at which water may be withdrawn will be determined by the OWNER.
   6. Cost of water for re-testing shall be paid by OWNER.

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D. Testing of piping is specified under Section 15051, Buried Piping Installation, and Section 15052, Exposed Piping Installation and on the Drawings.

E. Related Sections: CONTRACTOR shall coordinate the requirements of the Work in this Section along with the requirements of the Sections listed below which includes, but is not necessarily limited to, Work that is directly related to this Section.
   1. Section 15051, Buried Piping Installation.
   2. Section 15052, Exposed Piping Installation.

1.2 DEFINITIONS

A. The term “hydraulic structures” is defined as tanks, channels, and other structures through which liquid is conveyed or that hold liquid. Hydraulic structures include structures that are open to the atmosphere and structures with closed tops. Hydraulic structures, include but are not limited to, wet wells, junction chambers equalization tanks, storage tanks, treatment process tanks such as

grit chambers, clarifiers, aeration tanks, filter beds, contact tanks, and other channels or tanks as designated herein.

1. Excluded are structures where cleaning and testing are specified under other Sections or contracts.

1.3 SUBMITTALS

A. Provide written notice of the proposed testing schedule for a given structure for review by the ENGINEER and OWNER at least 10 days prior to the scheduled testing. Include proposed plans for water conveyance, control, and disposal. Testing will not commence without approval of OWNER or ENGINEER.

B. Shop Drawings: Submit for approval the following:
   1. Cleaning procedures.
   2. Hydrostatic testing procedures, methods, equipment, coordination, and schedules.
   3. Report for each test.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Temporary valves, bulkheads, and other water control equipment and materials, shall be determined by CONTRACTOR subject to the OWNER or ENGINEER'S review. No materials shall be used which would be injurious to the construction or its future function.

PART 3 – EXECUTION

3.1 CLEANING

A. Cleaning Requirements:
   1. Remove all scaffolding, planks, tools, rags, dirt, debris, and material not part of the structure prior to testing.
   2. Thoroughly clean the walls, floors, and operating equipment by sweeping, high-pressure wash, scrubbing, or other methods approved by OWNER or ENGINEER.
   3. Remove all water, dirt, or foreign material accumulated during cleaning from the hydraulic structure. Provide temporary pumps, piping, and facilities as required to discharge water from the cleaning operation in a manner approved by the OWNER.
   4. Do not proceed with testing until OWNER'S Representative has approved the results of the cleaning operation.
   5. Cleaning shall conform to the requirements of Section 01710, Cleaning.

3.2 GENERAL FOR TESTING AND DISINFECTION

A. The following requirements apply:
   1. Each chlorine contact basin channel shall be tested separately.
   2. Headworks structure shall be tested as a single unit from influent end to the outlet gates. Each upstream manhole and diversion box shall be tested separately.

B. Hydraulic structures shall be free of visible leakage. Repair leaks in a manner subject to OWNER or ENGINEER'S approval and in accordance with the Contract Documents.

C. The structure shall be tested prior to the application of exterior coating systems and the installation of masonry block veneer, if applicable.

D. Release of water from structures, after testing shall be as approved by the OWNER.

3.3 HYDROSTATIC TESTING OF HYDRAULIC STRUCTURES

A. Analysis of data from hydrostatic tests of hydraulic structures shall be performed by CONTRACTOR in accordance with the requirements of ACI 350.1 and as specified herein. CONTRACTOR shall supply all materials and labor to obtain the test data.

B. Prior to the start of hydrostatic testing, the following shall be met.
   1. All elements of the structure that will resist pressure exerted by the retained liquid shall be in place and at specified strength levels. Concrete shall be fully cured.
   2. Structure walls shall not be backfilled and, if damp proofing is specified, coated with damp proofing prior to leakage testing, unless otherwise approved by ENGINEER.
   3. All valves, gates, blind flanges, and other items, other than concrete, that control the flow of or otherwise retain the liquid contents of the structure, shall be checked for water-tightness. If not watertight, CONTRACTOR shall provide measures to ensure water-tightness during the hydrostatic test.
   4. Defective concrete shall be repaired.
   5. CONTRACTOR shall notify ENGINEER, OWNER'S Representative and OWNER a minimum of 96 hours prior to the start of filling of the structure for hydrostatic testing.
   6. Concrete hydraulic structures shall remain filled with clean water for an initial 48-hour period to allow for adsorption. Following this initial period, CONTRACTOR shall add make-up water to fill the hydraulic structure to the specified water surface test elevation.

C. Fill the hydraulic structure with clean water to the maximum water surface test elevation specified.

Hydraulic Structure Number	Hydraulic Structure Service	Water Surface Elevation for Testing
1. Effluent Box of Existing Chlorine Contact Basin	Conveyance	1549.8
2. New Reclaimed Water Splitter Structure	Conveyance	1549.8

D. Filling Hydraulic Structures with Water:
   1. Fill the portion of the hydraulic structure to be tested at a rate not to exceed two vertical feet per hour.
   2. Water supply shall be treated effluent water.

E. After water has been brought to the test elevation and the specified wetting period has elapsed, inspect the exposed surfaces of the structure for leakage. Repair locations where leakage or

weeping is evident prior to the start of hydrostatic testing.

F. Hydrostatic test duration shall be determined by the ENGINEER based on ACI 350.1, but shall not be less than 24 hours.

G. Allowable Leakage:
   1. Leakage is defined as the quantity of water that must be supplied to the hydraulic structure or any section thereof to maintain the water level within 3-inches of the specified water surface test elevation during the hydrostatic test, plus the amount of water required to fill the hydraulic structure to the specified water surface test elevation at the conclusion of the hydrostatic test, plus precipitation, minus an allowance for evaporation if applicable.
   2. For concrete structures without lining of interior wetted surfaces, the allowable leakage is 0.075 percent of the volume tested per 24-hour period.
   3. For concrete structures with interior wetted surfaces lined with a waterproof material, the allowable leakage is 0.050 percent of the volume tested per 24-hour period.

H. Measurement Locations:
   1. Structures or structure cells that are less than 1,000 square feet in water surface area shall have measurements of water level taken at a minimum of two locations that are approximately 180 degrees apart.
   2. Structures or structure cells that are greater than 1,000 square feet in water surface area shall have measurements of water level taken at a minimum of four locations that are approximately 90 degrees apart.
   3. Each measurement location shall be marked and given a reference number. A reference point shall be marked on the face of the wall above the test water surface in a manner that will prevent movement or deterioration of the reference point mark during the test.
   4. Measurement locations shall be located so that the effects of wave action and wind are minimized.

I. Evaporation and Precipitation Measurement:
   1. In hydraulic structures that are open to the atmosphere, a clear plastic calibrated open-topped container not less than 18-inches in diameter and depth shall be partially filled, floated in the tank, and held in position near each measurement location. Calibration increments shall be 0.1-inch or less.
   2. Containers shall be located so that they are not shaded by the structure's walls, and are away from overhead items such as beams, pipes, and walkways.

J. Test Measurements:
   1. Do not start hydrostatic tests when severe weather conditions, such as heavy precipitation, high winds, major changes in average daily temperature, and other severe conditions are predicted.
   2. Record the following measurements at each test location at the start of the test period and at 12-hour intervals thereafter.
      a. Distance from reference point to test water surface.
      b. Depth of water in the evaporation-precipitation containers.
      c. Temperature of the test water at a point 18-inches below the water surface.
      d. Temperature of the water in the evaporation-precipitation containers at mid-depth.
   3. If the water surface is subject to wave action at the measurement location, the average water surface elevation of the wave oscillations shall be recorded as the data.
   4. The change in the water surface elevation at each measurement location shall be averaged

and adjusted as follows:

a. The total change in the hydraulic structure's water surface elevation shall be adjusted by the average change in water surface elevation in the evaporation-precipitation containers.
b. Where the averaged water temperature measurements vary by more than 3 degrees from start to completion of the test period, adjustment in the test volume shall be determined by the change of the density of water resulting from the change in the average water temperature.

5. Determination of Leakage:
   a. Leakage shall be the drop in water surface elevation measured during the test multiplied by the water surface area of the hydraulic structure.

K. Criteria for Acceptance:
   1. The hydrostatic test will pass if the measured leakage is less than the allowable leakage and no leaks or weeping are observed.
   2. The hydrostatic test shall be considered to have failed if the allowable leakage is exceeded or if leakage or weeping is observed.
   3. If the test becomes unreliable due to excessive precipitation or other external factors, the test shall be re-started.
   4. If a hydrostatic test fails, the structure may be re-tested immediately without repairs if approved by the ENGINEER. If the subsequent hydrostatic test fails, CONTRACTOR shall repair probable areas of leakage and repeat the hydrostatic test.
   5. Re-test the structure until it meets the specified criteria for acceptance. Repair probable leakage areas before testing.

L. Reuse and Disposal of Water Used in Hydrostatic Tests:
   1. CONTRACTOR shall obtain written approval of the OWNER'S Representative before water used in one hydrostatic test is pumped to a different hydraulic structure for reuse in a subsequent test.
   2. Disposal of water shall be the responsibility of the CONTRACTOR at no additional cost to the OWNER.

M. The hydraulic structure shall not be backfilled or damp-proofed until acceptance of the hydrostatic test by the ENGINEER.

3.4 TESTING OF APPURTENANT PIPING

A. Piping appurtenant to hydraulic structures shall be tested as specified in applicable Sections.

+ + END OF SECTION + +

SECTION 01511

TEMPORARY ELECTRICITY

PART 1 - GENERAL

1.1 DESCRIPTION

A. Temporary electrical service shall be provided by CONTRACTOR until Substantial Completion of the Work, unless otherwise agreed by OWNER.

B. All costs, including the charge for power consumed, shall be assumed by CONTRACTOR. Also, provide power for testing and initial start-up of equipment.

C. The temporary service shall conform to applicable regulations and requirements

D. Materials and equipment may be new or used; however, they shall be in first class, fully serviceable condition and shall not create unsafe conditions or violate requirements of applicable codes.

E. Service is required for lighting, power tools, construction trailers, and similar usages. Electric space heaters and welding machines are not included herein.

1.2 POWER SOURCE AND SERVICE REQUIRED

A. Any service shall be provided and maintained so that power can be secured at any desired point with no more than a 50-foot extension.

B. One (1) power center, minimum, shall be provided at an approved location.

C. Provide each outlet with circuit breaker protection and comply with ground fault protective requirements of NEC.

D. Work hours are specified under the General Conditions.

E. Provide continuous power for construction site offices.

F. Provide power to maintain continuous operation of existing facilities during changeover of electrical equipment.

G. Provide power for testing, checking, and initial start-up of equipment

H. If OWNER occupies part of facility before final acceptance, cost of electricity for that portion will be shared proportionately.

1.3 INSTALLATION

A. Install temporary work in a neat orderly manner and make structurally and electrically sound throughout.

B. Maintain installation throughout construction period to give continuous service and to provide safe working conditions.

C. Modify service and rearrange wiring as Work progress requires.

D. Locate all facilities to avoid interference with hoisting, materials handling, storage, traffic areas, existing operable facilities and Work under other contracts.

E. Assume responsibility for and return to original condition any part of the permanent electrical system which is used for construction purposes.

1.4 REMOVAL

A. Completely remove temporary materials and equipment after permanent installation is in use.

B. Repair damage caused by the temporary service or its removal and restore to specified or original condition.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01514

TEMPORARY WATER

PART 1 - GENERAL

1.1 DESCRIPTION

A. Temporary water shall be provided by the CONTRACTOR, as specified in the paragraphs below.

1.2 DESCRIPTION OF SYSTEM

A. Furnish and install temporary water service for entire Project for use throughout construction period.

B. CONTRACTOR shall provide water hoses from hose bibs to point of operations.

C. Also, provide water for sanitary facilities, first aid facilities, field offices, cleaning, disinfection and testing.

D. Maintain adequate volume of water for all purposes.

E. Potable Water Source:
   1. Supplier: CONTRACTOR shall provide water source by connecting to existing utility mains at locations designated by OWNER and CONTRACTOR shall provide backflow preventers, where required. Hydrants cannot be taken out of service.
   2. Provide minimum 6-inch supply service and supply and install meter satisfactory to the OWNER.
   3. Permission shall be obtained from OWNER for water from hydrants.

F. Maintain strict supervision of use of temporary services:
   1. Enforce conformance with applicable codes and standards.
   2. Enforce sanitary practices.
   3. Prevent abuse of services.
   4. Prevent wasteful use of water.
   5. Protect system from freezing.

1.3 COSTS OF INSTALLATION AND OPERATION

A. Pay costs of temporary water service, including costs of installation, maintenance and removal of pipe and equipment.

B. Pay costs for water used by all trades.

1.4 REQUIREMENTS OF REGULATORY AGENCIES

A. Obtain and pay for permits, fees, deposits required by governing authorities.

B. Obtain and pay for temporary easements required across property, other than that of OWNER.

C. Comply with federal, state and local laws, ordinances, rules and regulations and standards, and with utility service company regulations.

1.5 USE OF OWNER'S EXISTING SYSTEM

A. Use existing system for temporary water for construction.

B. Modify and extend system as necessary to meet temporary water requirements.

C. Upon completion of Work, restore existing system to specified, or original condition.

1.6 MATERIALS

A. Comply with applicable provisions of Division 15, Mechanical.

B. Materials may be new or used, but must be adequate for purpose required, sanitary, and must not violate requirements of applicable codes.

C. Provide all required facilities, including piping, valves, pumps, pressure regulators, tanks and other appurtenances.

1.7 INSTALLATION

A. Install Work in a neat and orderly manner and make structurally and mechanically sound throughout.

B. Maintain to provide continuous service.

C. Modify and extend service as Work progress requires.

D. Locate piping and outlets to provide service convenient to work stations and to avoid interference with traffic and work areas, materials handling equipment, storage area, and work under other contracts.

E. Do not run piping on floor or on ground.

F. Provide drip pan under each hose bibb located within building, and connect drain to sewer.

G. Provide insulation, or other means, to prevent pipes from freezing.

H. When necessary to maintain pressure, provide temporary pumps, tanks and compressors.

1.8 REMOVAL

A. Completely remove temporary materials and equipment upon completion of construction.

B. Clean, repair damage caused by installation, and restore to specified or original condition.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01515

TEMPORARY SANITARY AND FIRST AID FACILITIES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Temporary sanitary and first aid facilities shall be provided by CONTRACTOR.

B. Provide temporary sanitary and first aid facilities for use throughout the construction period including:
   1. Potable water and sanitary drinking cups.
   2. Enclosed toilet facilities.
   3. Suitable general employee washing facilities.
   4. First aid stations at or immediately adjacent to all major Work areas and in the temporary field offices.
   5. Post telephone numbers of physicians, hospitals and ambulance services by each telephone at the Project site.
   6. At least one (1) person thoroughly trained in first aid procedures shall be present on the site, whenever Work is in progress. These persons must have a certificate indicating that they have completed a first aid training course conducted by the American Red Cross or other approved agency.

C. Provide facilities and fixtures in compliance with all applicable federal, state, and local laws, ordinances, standards, and regulations.

D. Maintain strict supervision of use of facilities.

E. Maintain, service and clean facilities and keep them supplied continuously with soap, towels, paper and all other required supplies.

F. Enforce proper use of sanitary facilities, including preventing the committing of nuisances in buildings on the site.

G. Dispose of all wastes in conformance with applicable regulations.

1.2 COSTS OF INSTALLATION AND OPERATION

A. Pay all cost including installation, maintenance and removal.

1.3 USE OF EXISTING SYSTEM

A. Existing facilities may not be used, unless an agreement is obtained in writing from the OWNER stating the conditions of use.

1.4 USE OF PERMANENT FACILITIES

A. Permanent facilities shall not be used by construction personnel.

1.5 INSTALLATION AND REMOVAL

A. Temporary flush toilets or portable toilets may be used.

B. Comply with all applicable provisions of Division 15, Mechanical.

C. Completely remove temporary materials and equipment upon completion of construction and restore all damaged facilities to original condition.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01540

SECURITY

PART 1 - GENERAL

1.1 DESCRIPTION

A. CONTRACTOR shall safely guard all Work, materials, equipment and property from loss, theft, damage and vandalism. CONTRACTOR'S duty to safely guard property shall include the OWNER'S property and other private property from injury or loss in connection with the performance of the Contract.

B. CONTRACTOR shall make no claim against the OWNER for damage resulting from trespass.

C. Party responsible for security shall make good all damage to property of OWNER and others arising from failure to provide adequate security.

D. If existing fencing or barriers are breached or removed for purposes of construction, CONTRACTOR shall provide and maintain temporary security fencing equal to the existing in a manner satisfactory to the OWNER.

E. Maintain security program throughout construction until OWNER'S acceptance and occupancy precludes need for CONTRACTOR'S security program.

F. All costs for security as specified in this Section shall be borne solely by CONTRACTOR.

1.2 CONTRACTOR'S ACCESS TO THE SITE

A. Access to the site for CONTRACTOR'S employees, material, tools and equipment shall be from the location indicated on the Drawings.

B. CONTRACTOR shall ensure that each of his employees, representatives, material suppliers and others acting for CONTRACTOR, shall be subject to the following regulations:

1. CONTRACTOR'S Subcontractors, Suppliers and Manufacturer's employee's shall not park anywhere other than parking area designated for the CONTRACTOR. The Area shall be designated by the OWNER. CONTRACTOR shall prepare and maintain this area, as required.
2. All work vehicles, including those belonging to CONTRACTOR, his employees and Subcontractors and his material suppliers entering the plant site shall conform to all security and safety regulations in force at the site.
3. Personal vehicles shall not be allowed outside the employee parking area.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01541

PROTECTION OF THE WORK AND PROPERTY

PART 1 - GENERAL

1.1 DESCRIPTION

A. CONTRACTOR shall be responsible for taking all precautions, providing all programs, and taking all actions necessary to protect the Work and all public and private property and facilities from damage as specified in the General Conditions and herein.

B. In order to prevent damage, injury or loss, CONTRACTOR'S actions shall include, but not be limited to, the following:
   1. Store apparatus, materials, supplies, and equipment in an orderly, safe manner that will not unduly interfere with the progress of the Work or the Work of any other contractor or utility service company.
   2. Provide suitable storage facilities for all materials subject to injury by exposure to weather, theft, breakage, or otherwise.
   3. Place upon the Work or any part thereof only such loads as are consistent with the safety of that portion of the Work.
   4. Clean up frequently all refuse, rubbish, scrap materials, and debris caused by his operations, to the end that at all times the site of the Work shall present a safe, orderly and workmanlike appearance.
   5. Provide barricades and guard rails around openings, for scaffolding, for temporary stairs and ramps, around excavations, elevated walkways and other hazardous areas.

C. CONTRACTOR shall not, without written consent from proper parties, enter or occupy privately-owned land with personnel, tools, materials or equipment, except on easements provided herein.

D. CONTRACTOR shall assume full responsibility for the preservation of all public and private property or facility on or adjacent to the site. If any direct or indirect damage is done by or on account of any act, omission, neglect or misconduct in the execution of the Work by CONTRACTOR, it shall be restored by CONTRACTOR, at his expense, to a condition equal to that existing before the damage was done.

1.2 PROTECTION OF EXISTING STRUCTURES

A. Underground Structures:
   1. Underground structures are defined to include, but are not limited to, all sewer, water, gas, and other piping, and manholes, chambers, electrical conduits, tunnels and other existing subsurface work located within or adjacent to the limits of the Work.
   2. All underground structures known to OWNER, except water, gas, sewer, electric, and telephone service connections, are shown. This information is shown for the assistance of CONTRACTOR, in accordance with the best information available, but is not guaranteed to be correct or complete.

3. CONTRACTOR shall explore ahead of his trenching and excavation Work and shall uncover all obstructing underground structures sufficiently to determine their location, to prevent damage to them and to prevent interruption to the services which such structures provide. If CONTRACTOR damages an underground structure, he shall restore it to original condition at his sole expense.
4. Necessary changes in the location of the Work may be made by OWNER to avoid unanticipated underground structures.
5. If permanent relocation of an underground structure or other subsurface facility is required and is not otherwise provided for in the Contract Documents, OWNER'S REPRESENTATIVE will direct CONTRACTOR, in writing, to perform the Work, which shall be paid for under the provisions of the General Conditions.

B. Surface Structures:
1. Surface structures are defined as all existing buildings, structures, utilities and other facilities above the ground surface. Included with such structures are their foundations or any extension below the surface. Surface structures include, but are not limited to, buildings, tanks, walls, bridges, roads, dams, channels, open drainage, piping, poles, wires, posts, signs, markers, curbs, walks and all other facilities that are visible above the ground surface.

C. Protection of Underground and Surface Structures:
1. CONTRACTOR shall sustain in their places and protect from direct or indirect injury all underground and surface structures located within or adjacent to the limits of the Work. Such sustaining and supporting shall be done carefully and as required by the party owning or controlling such structure. Before proceeding with the Work of sustaining and supporting such structure, CONTRACTOR shall satisfy the OWNER'S REPRESENTATIVE that the methods and procedures to be used have been approved by the party owning same.
2. CONTRACTOR shall assume all risks attending the presence or proximity of all underground and surface structures within or adjacent to the limits of the Work. CONTRACTOR shall be responsible for all damage and expense for direct or indirect injury caused by his Work to any structure. CONTRACTOR shall repair immediately all damage caused by his work, to the satisfaction of the owner of the damaged structure.

D. All other existing surface facilities, including but not limited to, guard rails, posts, guard cables, signs, poles, markers, and curbs, which are temporarily removed to facilitate installation of the Work, shall be replaced and restored to their original condition at CONTRACTOR'S expense.

1.3 PROTECTION OF INSTALLED PRODUCTS

A. Provide protection of installed products to prevent damage from subsequent operations. Remove protection facilities when no longer needed prior to completion of Work.

B. Control traffic to prevent damage to equipment, materials and surfaces.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01550

ACCESS ROADS AND PARKING AREAS

PART 1 - GENERAL

1.1 DESCRIPTION

A. CONTRACTOR shall provide all temporary construction roads, walkways and parking areas required during the construction and for use of emergency vehicles including Fire prevention operations. Temporary roads and parking areas shall be designed and maintained by CONTRACTOR so as to be fully usable in all weather conditions.

B. This site has limited access for parking areas and roadways. The CONTRACTOR shall be responsible for arrangements of large truckloads as well as off-site parking areas for workers.

C. CONTRACTOR shall prevent interference with traffic and the OWNER'S operations on existing roads. CONTRACTOR shall indemnify and save harmless the OWNER from any expenses caused by CONTRACTOR'S operations.

D. Roadways damaged by CONTRACTOR shall be restored to their original condition by CONTRACTOR subject to approval of the OWNER'S REPRESENTATIVE.

E. Temporary roads, walkways and parking areas shall be removed by CONTRACTOR, prior to final acceptance, and the ground returned to its original condition, unless otherwise required by the Contract Documents.

1.2 DESIGNATED PARKING

A. All CONTRACTOR'S employee vehicles shall park in an area specifically designated for that purpose, as more fully described in Section 01540, Security.

1.3 MAINTENANCE OF ROADS

A. CONTRACTOR shall at all times, maintain approved access for trucks to loading areas of the site and parking facilities for OWNER. All parking of construction vehicles shall be in approved areas.

B. Dust resulting from construction shall be controlled by CONTRACTOR to prevent a nuisance on the site or in adjacent areas. CONTRACTOR shall apply water or use other methods subject to the OWNER'S REPRESENTATIVE approval, which will keep dust in the air to a minimum. Use of water will not be permitted when it results in hazardous or objectionable conditions such as mud, ponds and pollution.

C. CONTRACTOR shall provide temporary heavy duty steel roadway plates to protect existing manholes, handholes, valve boxes, and vaults within the Work area.

PART 2 - PART 2 - PRODUCTS (NOT USED)

PART 3 - PART 3 - EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01560

TEMPORARY CONTROLS

PART 1 - GENERAL

1.1 DESCRIPTION

A. CONTRACTOR shall provide and maintain methods, equipment, and temporary construction, as necessary to provide controls over environmental conditions at the construction site and adjacent areas. Remove physical evidence of temporary facilities at completion of Work.

B. CONTRACTOR shall obtain all local, County and State permits required for the construction of all Work, including Hazardous Material Management, Earth Moving/ Dust Control and Stormwater Pollution Prevention Permits.

1.2 NOISE CONTROL

A. CONTRACTOR'S vehicles and equipment shall be such as to minimize noise to the greatest degree practicable. Noise levels shall conform to the latest OSHA standards and in no case will noise levels be permitted which interfere with the Work of the OWNER or others.

1.3 DUST CONTROL

A. CONTRACTOR shall obtain an earthmoving permit and any other permit required for dust control related to the Work as required by appropriate agency.

B. CONTRACTOR shall be responsible for controlling objectionable dust caused by his operation of vehicles and equipment, clearing or for any reason whatever. CONTRACTOR shall apply water or use other methods, subject to the OWNER'S REPRESENTATIVE approval, which will keep dust in the air to a minimum. During the months of March through November, CONTRACTOR shall apply water at least four (4) times daily during normal work hours and once (1) at dusk.

1.4 PEST AND RODENT CONTROL

A. Provide rodent and pest control as necessary to prevent infestation of construction or storage areas.
   1. Employ methods and use materials not adversely affecting conditions at the site or on adjoining properties.

1.5 WATER CONTROL

A. Provide methods to control surface water and water from excavations and structures to prevent damage to the Work, the site, or adjoining properties.
   1. Control fill, grading and ditching to direct water away from excavations, pits, tunnels and other construction areas and to direct drainage to proper runoff courses so as to prevent any erosion, damage or nuisance.

B. CONTRACTOR shall provide a Stormwater Pollution Prevention Plan to Arizona Department of Water Quality for approval. CONTRACTOR shall prepare all required documents and certifications, perform inspections and furnish all materials, labor and equipment necessary to comply with all requirements of the NPDES General Permit for Stormwater Discharge.

C. Provide, operate and maintain equipment and facilities of adequate size to control surface water.

D. Dispose of drainage water in a manner to prevent flooding, erosion, or other damage to any portion of the site or to adjoining areas and in conformance with all environmental requirements.

E. Stormwater shall be retained on-site at a location approved by the OWNER'S REPRESENTATIVE. No off-site discharges will be permitted.

1.6 EROSION CONTROL

A. Plan and execute construction and earth work by methods to control surface drainage from cuts and fills, and from borrow and waste disposal areas, to prevent erosion and sedimentation.
   1. Hold the areas of bare soil exposed at one time to a minimum.
   2. Provide temporary control measures such as berms, dikes and drains.

B. Construct fills and waste areas by selective placement to eliminate surface silts or clays which will erode.

C. Periodically inspect earthwork to detect any evidence of the start of erosion; apply corrective measures as required to control erosion.

D. Coordinate erosion control requirements with the requirements of Paragraph 1.05, above.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01620

INSTALLATION OF EQUIPMENT

PART 1 - -GENERAL

1.1 DESCRIPTION

A. This Section describes Work necessary to install equipment and materials to be incorporated into this Project and supplements the Specification requirements in Division 2, Sitework, through Division 16, Electrical.

B. Shop Drawings, installation drawings and instructions finished by the manufacturers shall be used by CONTRACTOR in the installation of the equipment and materials.

1.2 ANCHOR BOLTS AND GROUT

A. Anchor and expansion bolts shall be furnished by CONTRACTOR, as specified and required. Use expansion bolts only where shown or approved by OWNER or required by the manufacturer. Anchor and expansion bolts shall be of specified materials with heavy hexhead nuts. Anchorage items shall conform to the applicable requirements of Section 05051, Anchor Bolts, Expansion Anchors, Toggle Bolts and Concrete Inserts.

B. Grouting shall be in accordance with Section 03600, Grout.

1.3 TRANSPORTING, HANDLING AND INSTALLING EQUIPMENT AND MATERIALS

A. CONTRACTOR shall conform to requirements of Section 01600, General Equipment Provisions and Division 1 requirements of Package 0.

B. CONTRACTOR shall employ competent mechanics experienced in the installation of the types of equipment and materials to be furnished, and shall ensure that all equipment and materials are installed in accordance with the recommendations of the manufacturers.

1.4 EQUIPMENT ERECTION

A. General: Conform to the following as a minimum:
   1. Use only mechanics, machinists or mill wrights skilled in the handling, setting, aligning, leveling and adjusting of the type of equipment and materials furnished.
   2. Use only an oil bath heater to expand couplings, gears, etc. Do not force or drive them on equipment shafts, nor subject them to an open flame or torch.
   3. Wedging shall not be permitted. Use the least number of flat shims possible in leveling equipment. Shims shall be clean and free of slags. Provide all shims, filling pieces, keys, packing, red or white lead grout, or other materials necessary to properly align, level and secure apparatus in place. When requested by OWNER, CONTRACTOR shall demonstrate that all elements so required are level and plumb. Grind as necessary to bring parts to proper bearing after erection.
   4. Use proper tools in the assembly of equipment and materials to prevent deforming or marring the surface of shafts, nuts or other parts.

5. Tighten connections requiring gaskets evenly all around to ensure uniform stress over the entire gasket area.
6. Equipment and materials shall not be altered or repaired, and no burning or welding shall be permitted on any parts having machined surfaces, except by written permission of OWNER.
7. No rigging shall be done from any structure without the permission of OWNER, and CONTRACTOR shall be completely responsible for damage to the structure resulting from his operations.
8. Use tools, equipment and materials that shall not damage the structure or equipment.
9. CONTRACTOR shall finish and install plugs in lubrication holes to prevent entry of foreign material.
10. Electrical work, testing, lubricating and painting shall all comply with requirements of the applicable Section.

B. Setting and Erection:
1. All units shall be carefully set and aligned on their foundations, by qualified millwrights, after their sole plates have been shimmed to true alignment at the anchor bolts. Anchor bolts shall be set in place and the nuts tightened against the shims. Bedplates or wing feet of the equipment shall be further checked after securing to the foundations and, after confirmation of all alignments, the sole plates shall be finally grouted in place. CONTRACTOR shall be responsible for the correct alignment of equipment with its associated piping. "Pipe springing" shall not be allowed.
2. Misaligned holes shall be reamed. "Driving" of bolts or keys shall not be permitted.

C. Jacking Screws and Anchor Bolts:
1. All equipment shall be anchored to supporting members by bolts or other connections to accommodate all operating forces and satisfy the seismic restraint requirements of the Uniform Building Code for Zone I Seismic Area. Anchors shall provide resistance to a lateral force of at least 0.30 times the weight of the equipment, including its contents.
2. Jacking screws shall be provided in the heavy equipment bases and bedplates, and where required elsewhere, to aid in leveling during installation.
3. Anchor bolt setting drawings shall be delivered sufficiently early to permit setting the anchor bolts when the structural steel support frame is fabricated by others.
4. All anchor bolts and anchoring hardware shall be of Type 316 stainless steel. Expansion bolts shall only be used where permitted by the OWNER and shall be Type 316 stainless steel. Alternate methods of anchoring to those shown on the Contract Documents shall meet the requirements of this Section and shall be submitted to the OWNER for review. Submittal on alternate anchoring methods shall be done in accordance with Section 01630, Substitutions.

D. Alignment and Leveling:
1. Field check all shafts, couplings and sheaves for alignment and adjust to manufacturer's specifications where necessary.
2. Couplings shall be aligned while the equipment is free from all external loads.
3. Angular and parallel alignment shall be checked, and the actual alignment shall be recorded and submitted to OWNER. Alignment shall be within manufacturer's recommended tolerance.
4. Dial indicators shall be used for the checking of angular and parallel alignment. During rotation of the half couplings in performance of this test, they shall be maintained in the

same relative position, and the dial indicator readings shall be taken at the same place on the circumference of the coupling.

E. Threaded Connections:
   1. Apply a molybdenum disulfide, anti-seize compound to all threads in mechanical connections such as bolts, studs, cap screws, tubing, etc., unless otherwise specified.

F. Equipment Drive Guards:
   1. Unless shown or specified otherwise, provide all equipment driven by open shafts, belts, chains, pulleys, sheaves, or gears with all-metal guards conforming to the requirements of Section 01600, General Equipment Provisions.

1.5 EQUIPMENT INSTALLATION

A. CONTRACTOR shall obtain installation instruction booklets or other recommendations from the equipment manufacturers as to procedures for, sequence of, and tolerances allowed in equipment installation. In particular, the manufacturer's recommendations as to grout spaces required, type of grout to be used, and tolerances for level and alignment, both vertical and horizontal, shall be obtained and followed. One (1) copy of this material shall be given to the OWNER prior to the installation of the equipment.

B. Whenever applicable, CONTRACTOR shall obtain the services of a manufacturer's representative specifically trained in erection of his equipment to supervise the installation. CONTRACTOR shall be responsible for the proper alignment of all installed driven equipment and drives in accordance with the tolerance recommendation of the manufacturers for both OWNER furnished and CONTRACTOR furnished equipment. Within fourteen (14) calendar days after installation, CONTRACTOR shall submit to the OWNER a letter from the manufacturer, on the manufacturer's letterhead, stating all equipment and components are installed in accordance with the manufacturer's requirements and installation instructions as described in these Specifications.

C. Skilled craftsmen experienced in installation of the equipment or similar equipment shall be used. Applicable specialized tools and equipment, such as precision machinist levels, dial indicators, and gauges shall be utilized as required in the installations. The Work shall be accomplished in a workmanlike manner to produce satisfactory equipment installation free of vibration or other defects.

D. CONTRACTOR shall install all OWNER furnished equipment in accordance with the installation instructions, Shop Drawings and submittal provided by the equipment manufacturers and available at the OWNER offices for CONTRACTOR'S use.

E. Prior to installation of equipment, all sacking and concrete preparation shall be completed and the Work area shall be maintained in a broom-clean condition during the equipment installation.

F. No equipment and materials shall be altered or repaired, and no burning or welding shall be permitted on any parts having machined surfaces, except by written permission of the OWNER.

G. No rigging shall be done from any structure without the permission of the OWNER, and CONTRACTOR shall be completely responsible for. any damage to the structure due to his operations.

H. Only such equipment and materials as will not damage the structure or equipment and materials shall be used on the Work.

1.6 SPECIAL TOOLS

A. All special tools that are required to assemble, disassemble, repair, and maintain any item of equipment furnished under the terms of this Contract shall be furnished with the equipment. When special tools are provided, they shall be marked or tagged, and a list of such tools shall be included with the maintenance and operation instructions for the equipment.

1.7 COORDINATION

A. CONTRACTOR shall take all measurements for Work at the installation sites, verify all subcontractor's and manufacturer's drawings, shall be responsible for the proper installation within the available space of the apparatus specified and shown on the Drawings and shall inform the OWNER of any variations and shall submit all proposed changes for review before making any changes.

1.8 SERVICES OF MANUFACTURERS' REPRESENTATIVE

A. Equipment furnished under Divisions 11, 13, 14, 15 and 16 shall include the cost of competent, qualified representatives of manufacturers of all equipment to supervise the installation, adjustment and testing of the equipment and to instruct the OWNER'S operating personnel on operation and maintenance. The training time and additional requirements for furnishing services of manufacturers' representatives are specified in the appropriate Sections. If no time is specified, the training time shall be at least one (1) day. Supervision may be divided into two (2) or more time periods as required by CONTRACTOR'S schedule or as directed by OWNER.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01710

CLEANING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Execute cleaning, during progress of the Work, at completion of the Work, and as required by General Conditions. If CONTRACTOR fails to clean areas as specified in this Section, the OWNER will have the areas cleaned and the effort will be backcharged against the CONTRACTORS Contract Price. Furthermore, the Owner will not release the final retainage payment to the CONTRACTOR unless the areas as specified in this Section are clean at completion of the Work.

B. The CONTRACTOR shall provide all means possible to protect the materials from contamination of any kind at no additional cost to the OWNER.

C. Requirements of Regulatory Agencies:
1. In addition to the requirements herein, maintain the cleanliness of the Work and surrounding premises within the Work limits so as to comply with federal, state, and local fire and safety laws, ordinances, codes and regulations.
2. Comply with all federal, state and local anti-pollution laws, ordinances, codes and regulations when disposing of waste materials, debris and rubbish.

D. Scheduling of Cleaning and Disposal Operations:
1. So that dust, wash water or other contaminants generated during such operations do not damage or mar painted or finished surfaces.
2. To prevent accumulation of dust, dirt, debris, rubbish and waste materials on or within the Work or on the premises surrounding the Work.

E. Waste Disposal:
1. Dispose of all waste materials, surplus materials, debris and rubbish off the project site.
2. Do not bum or bury rubbish and waste materials on the project site.
3. Do not dispose of volatile or hazardous wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains.
4. Do not discharge wastes into streams or waterways.
5. CONTRACTOR shall be solely responsible for complying with any federal, state, and local environmental and regulations in disposing of waste.

F. Cleaning Materials:
1. Use only cleaning materials recommended by manufacturer of surface to be cleaned.
2. Use each type of cleaning material on only those surfaces recommended by the cleaning material manufacturer.
3. Use only materials which will not create hazards to health or property.

G. During Construction:

1. Keep the Work and surrounding premises within Work limits free of accumulations of dirt, dust, waste materials, debris and rubbish.
2. Keep dust generating areas wetted down.
3. Provide suitable containers for storage of waste materials, debris and rubbish until time of disposal.
4. Dispose of waste, debris and rubbish off site to legal disposal areas.

H. When Project is Completed:
1. Remove and dispose of all excess or waste materials, debris, rubbish, and temporary facilities from the site, structures and all facilities.
2. Repair pavement, roads, sod, and all other areas affected by construction operations and restore them to original condition or to minimum condition specified.
3. Remove spatter, grease, stains, fingerprints, dirt, dust, labels, tags, packing materials and other foreign items or substances from interior and exterior surfaces, equipment, signs and lettering.
4. Repair, patch and touch up chipped, scratched, dented or otherwise marred surfaces to match specified finish.
5. Remove paint, clean and restore all equipment and material nameplates, labels and other identification markings.
6. Wash and shine mirrors, glazing and polished surfaces.
7. Clean all floors, slabs, pavements, and ground surfaces.
8. Maintain cleaning until acceptance and occupation by OWNER.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01720

RECORD DOCUMENTS

PART 1 - GENERAL

1.1 DESCRIPTION

A. CONTRACTOR shall maintain and provide the OWNER with Record Documents as specified below.

B. Maintenance of Documents:
   1. Three (3) sets of black line sets of plans, including Addenda, of the Contract Drawings will be furnished to CONTRACTOR by the OWNER'S REPRESENTATIVE.
   2. Maintain in CONTRACTOR'S field office in clean, dry, legible condition complete sets of the following: Drawings, Specifications, Addenda, approved Shop Drawings, Samples, photographs, Change Orders, other modifications of Contract Documents, test records, survey data, Field Orders, and all other documents pertinent to CONTRACTOR'S Work.
   3. Provide files and racks for proper storage and easy access.
   4. Make documents available at all times for inspection by OWNER'S REPRESENTATIVE.
   5. Record Documents shall not be used for any other purpose and shall not be removed from CONTRACTOR'S office without OWNER'S REPRESENTATIVE approval.

C. Marking System: Changes, revisions, additions and deletions, to the record set of Drawings shall be marked in Red.

D. Recording:
   1. Label the Cover Sheet, Index and each supplemental sheets of each document "PROJECT RECORD" in 2-inch high printed letters.
   2. Keep record documents current. CONTRACTOR'S refusal, failure or neglect to maintain current Record Documents shall constitute sufficient basis for the OWNER to recommend the withholding of some or all of any payment due.
   3. Do not permanently conceal any Work until required information has been recorded.
   4. Drawings: Legibly mark to record actual construction including:
      a. Depths of various elements of foundation in relation to datum.
      b. Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvements.
      c. Location of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of structure.
      d. Field changes of dimensions and details.
      e. Changes made by Change Order or Field Order.
      f. Details not on original Drawings.
   5. Specifications and Addenda: Legibly mark up each Section to record:
      a. Manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually installed.

b. Changes made by Change Order or Field Order.
c. Other matters not originally specified.

E. Record Drawings:
1. Record Drawings shall be prepared for all the Work included in the Contract. At the completion of the installation of the major Work area and the Work CONTRACTOR shall furnish to the OWNER redlined Drawings showing the actual in-place installation of the items installed under this Contract. The Drawings shall show the Work in plan and sections as required for clarity with reference dimensions and elevations for complete Record Drawings. The Drawings shall be furnished prior to Substantial Completion of the Work.
2. At the completion of all Instrumentation and Control and Electrical Work under the Contract, CONTRACTOR shall furnish to the OWNER, redlined Drawings showing one line diagrams with all conduit and wire sizes shown of the distribution systems and the actual in-place grounding system, lighting arrangement, motor control centers, corrected wiring diagrams, equipment and conduit and cable plans. The Drawings shall be furnished prior to the Substantial Completion of the Work.
a. The Contract Drawings may be used as a starting point in developing the record drawings. Subcontractor and manufacturer drawings may be included in this drawing package. The drawing package must be fully integrated and include the necessary cross references between drawings. The drawing package shall include interconnection and termination details to equipment furnished under this Contract.
b. All drawings must be submitted for approval of the OWNER. This shall include the following composite drawings for the system being furnished:
1) Schematic (Elementary) Diagrams: This shall include, but not be limited to, complete schematics including items furnished by others for the following:
a) Motor Control Circuits for Starters furnished under this Contract.
b) Substation Controls.
c) HVAC Control Panels furnished under this Contract.
2) Wiring (Connection) Diagrams: These shall be included for all prewired equipment furnished under this Contract.
3) Interconnection Diagrams: These shall include all interconnections to be furnished under this Contract.
4) Conduit and Cable Schedules: These shall include all conduit and cable furnished under this Contract.
5) Dimension of Outline Drawings: These shall include all equipment furnished under this Contract.
6) Power and Lighting Layout Drawings: These shall include all conduits and wiring furnished under this Contract.
3. In addition to the redlined Record Drawings, CONTRACTOR shall prepare and submit CADD files (AutoCad Rel. 2007) for all supplemental drawings used to complete the Record Drawings.

F. Submittal:
1. Acceptance of CONTRACTOR'S monthly application for payment shall be dependent on the OWNER'S acceptance and agreement that CONTRACTOR'S

Record Documents are complete, thorough and acceptable in showing all work up through and including such work as CONTRACTOR is claiming for completion and payment on CONTRACTOR'S application for payment. Any items which do not appear on the Record Documents in complete and acceptable form shall not be paid for in the CONTRACTOR'S monthly payment.

2. Examination by the OWNER of CONTRACTOR'S Record Documents will be made on a monthly basis to determine completion for consideration of monthly pay application. CONTRACTOR shall, however, make available all Record Documents at all times to the OWNER for examination.
3. Prior to Completion of the Work, deliver Record Documents to OWNER. Final payment will not be made until satisfactory Record Documents are received by OWNER.
4. Accompany submittal with transmittal letter containing:
   a. Date.
   b. Project title and number.
   c. CONTRACTOR'S name and address.
   d. Title and number of each Record Document.
   e. Certification that each document as submitted is complete and accurate.
   f. Signature of CONTRACTOR, or his authorized representative.

PART 2 - PRODUCTS (NOT USED

PART 3 - EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01760

POST FINAL INSPECTION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Approximately 30 days or less after substantial completion, OWNER will make arrangements with CONTRACTOR for a Post Final Inspection and will send a written notice to said parties informing them of the date and time of the inspection.

B. After the inspection, OWNER will inform CONTRACTOR of any corrections required prior to release of the balance of payment due and forward a certificate for final payment.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 02050

DEMOLITION, REMOVAL AND DISPOSAL

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified and required for demolitions, removal and disposal Work.
   2. Included, but not limited to, are demolitions and removals of existing materials, equipment, or Work necessary to install the Work as shown and specified and to connect same with existing work in an approved manner. Demolition includes structural concrete, foundations, walls, doors, windows, structural steel, metals, roofs, masonry, attachments, appurtenances, piping, electrical and mechanical equipment, paving, curbs, walks, fencing, and similar existing facilities.
   3. Demolitions and removals which may be specified under other Sections shall conform to requirements of this Section.
   4. CONTRACTOR shall pay for all landfill disposal fees.

B. Related Sections:
   1. Section 01010, Summary of Work.
   2. Section 02220, Excavation and Backfill.

1.2 SUBMITTAL

A. Schedule: Submit for approval proposed methods, equipment, and operating sequences. Include coordination for shut-off, capping, temporary services, continuation of utility services, and other applicable items to ensure no interruption of OWNER'S operations.

1.3 JOB CONDITIONS

A. Protection:
   1. Perform all demolition and removal Work to prevent damage or injury to structures, occupants thereof and adjacent features which might result from falling debris or other causes, and so as not to interfere with the use, and free and safe passage to and from adjacent structures.
   2. Closing or obstructing of roadways, sidewalks, and passageways adjacent to the Work by the placement or storage of materials will not be permitted, and all operations shall be conducted with a minimum interference to traffic on these ways.
   3. Erect and maintain barriers, lights, sidewalk sheds, and other necessary protective devices.
   4. Repair damage to facilities to remain or to any property belonging to the OWNER or occupants of the facilities.

B. Scheduling:
   1. Carry out operations so as to avoid interference with OWNER’S operations and work in the existing facilities.

C. Notification:
   1. At least 48 hours prior to commencement of a demolition or removal, notify OWNER in writing of proposed schedule. OWNER will inspect the existing equipment and mark for identification those items to remain the property of the OWNER. Do not start removals without the approval of the OWNER.

D. Explosives:
   1. Do not bring explosives on site nor use explosives without written consent of authorities having jurisdiction. Such written consent will not relieve CONTRACTOR of total responsibility for injury or damage caused by his blasting operations.
   2. Perform all blasting, if permitted, in compliance with applicable governing regulations.

PART 2 - PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 GENERAL

A. All materials and equipment removed from existing work shall become the property of CONTRACTOR, except for those the OWNER has identified and marked for his use. All materials and equipment marked by the OWNER to remain shall be carefully removed by CONTRACTOR, so as not to be damaged, and shall be cleaned and stored on or adjacent to the site in a protected place specified by the OWNER or loaded onto trucks provided by the OWNER.

B. CONTRACTOR shall dispose of all demolition materials, equipment, debris, and all other items not marked by the OWNER to remain, off the site and in conformance with all existing applicable laws and regulations.

C. Pollution Controls: Use water sprinkling, temporary enclosures, and other suitable methods to limit the amount of dust and dirt rising and scattering in the air to the lowest practical level. Comply with governing regulations pertaining to environmental protection.
   1. Do not use water when it may create hazardous or objectionable conditions such as flooding, and pollution.
   2. Clean adjacent structures, facilities, and improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to conditions existing prior to the start of the Work.

D. Pavement Demolition:
   1. All asphalt and concrete pavement demolition shall terminate at cut edges. All edges shall be linear and have a vertical cut face.

3.2 STRUCTURAL REMOVALS

A. Remove structures to the lines and grades shown, unless otherwise directed by the OWNER. Where no limits are shown, the limits shall be 4-inches outside the item to be installed. The removal of masonry beyond these limits shall be at the CONTRACTOR'S expense and these

excess removals shall be reconstructed to the satisfaction of the OWNER with no additional compensation to CONTRACTOR.

B. All concrete, brick, tile, concrete block, roofing materials, reinforcement, structural or miscellaneous metals, plaster, wire mesh and other items contained in or upon the structure shall be removed and taken from the site, unless otherwise approved by the OWNER. Demolished items shall not be used in backfill.

C. After removal of parts or all of masonry walls, slabs and like work that tie into the Work or existing work, the point of junction shall be neatly repaired so as to leave only finished edges and surface exposed.

D. The jambs, sills and heads of any windows, passageways, doors, or other openings cut into the Work or existing work, shall be dressed with masonry, concrete or metal to provide a smooth, finished appearance.

E. Where anchoring materials, including bolts, nuts, hangers, welds and reinforcing steel, are required to attach the Work to the existing work, they shall be included under this Section, except where specified elsewhere.

3.3 MECHANICAL REMOVALS

A. Mechanical removals shall consist of dismantling and removing of existing piping, pumps, motors, equipment and other appurtenances as specified, shown, or required for the completion of the Work. It shall include cutting, capping, and plugging as required, except that the cutting of existing piping for the purpose of making connections thereto, included under Division 15.

B. Existing process, water, chemical, gas, fuel oil and other piping not required for the Work shall be removed where shown or where it will interfere with the Work. Piping not shown to be removed or which does not interfere with the Work shall, at the nearest solid support, be capped and left in place.

C. When existing underground piping is to be altered or removed, the remaining piping shall be properly capped and restrained. Abandoned underground piping shall be removed.

D. Any changes to existing potable water piping and other plumbing and system work shall be made in conformance with all applicable codes and under the same requirements as other underground piping. All portions of the potable water system that have been altered or opened shall be pressure tested and disinfected in accordance with Section 15051 and local codes. Other plumbing piping and heating piping shall be pressure tested only.

3.4 ELECTRICAL REMOVALS AND DEMOLITION

A. Electrical removals shall consist of the removal of existing transformers, distribution switchboards, control panels, motors, conduits and wires, poles and overhead wiring, panelboards, lighting fixtures, and miscellaneous electrical equipment as shown, specified, or required to perform the Work.

B. All existing electrical equipment and fixtures to be removed shall be removed with such care as may be required to prevent unnecessary damage, to keep existing systems in operation and to keep the integrity of the grounding systems.

3.5 CLEAN-UP

A. CONTRACTOR shall remove from the site all debris resulting from the demolition operations as it accumulates. Upon completion of the Work, all materials, equipment, waste, and all debris shall be removed and premises shall be left clean, neat and orderly.

+ + END OF SECTION + +

SECTION 02110

CLEARING AND GRUBBING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment and incidentals required to perform all clearing and grubbing as shown and specified.

B. Related Sections:
   1. Section 02050, Demolition, Removal and Disposal.
   2. Section 02220, Excavation and Backfill.

C. The Work covered by this Section consists of removing and disposing of all approved trees, stumps, bush, roots, shrubs, vegetation, logs, rubbish, organic material and other undesirable material from the plant site, as required to perform the Work.

1.2 QUALITY ASSURANCE

A. Codes and Standards: The OWNER shall govern the hauling and disposal of trees, shrubs, stamps, roots, rubbish, debris and other materials.

1.3 JOB CONDITIONS

A. Protection:
   1. Streets, roads, adjacent property and other works and structures shall be protected throughout the entire project. CONTRACTOR shall return to original condition, satisfactory to the OWNER, damaged facilities caused by CONTRACTOR'S operations without additional compensation. Trees, shrubs, grassed, landscaped areas, and other areas which are to remain, shall be protected by fences, barricades, wrapping or other methods as required, shown, specified or approved by the OWNER. Trees and cacti shall not be removed without approval of the OWNER, unless otherwise shown or specified.

1.4 GUARANTEE

A. CONTRACTOR shall guarantee that Work performed shall not permanently damage cacti, trees, shrubs, turf or plants designated to remain, or other adjacent Work or facilities. If damage resulting from CONTRACTOR'S operations appears during the period up to 18 months after completion of the project, CONTRACTOR shall replace damaged items, at no additional cost to OWNER.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 CLEARING AND GRUBBING

A. Limits of clearing shall be all areas within the Contract limit lines, except as otherwise shown. Damage outside these limits caused by CONTRACTOR'S operations shall be corrected at CONTRACTOR'S expense.

B. CONTRACTOR shall remove from the site and satisfactorily dispose of all trees, shrubs, stumps, roots, brush, masonry, rubbish, scrap, debris, pavement, curbs, fences, excess topsoil, and miscellaneous other structures not covered under other Sections as shown, specified or otherwise required to permit construction of the Work.

C. No cleared or grubbed material may be used in backfills or structural embankments.

D. Control air pollution caused by dust and dirt, and comply with governing regulations.

E. Burning on site is not allowed.

++ END OF SECTION ++

SECTION 02220

EXCAVATION AND BACKFILL

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment and incidentals required to perform all excavating, backfilling, testing, filling and grading, and disposing of earth materials as shown, specified, and required for construction of structures, manholes, vaults, conduits, pipelines, roads, and other facilities required to complete the Work in every respect.
   2. All necessary preparation of subgrade for slabs, foundations and pavements is included in this Section.
   3. All temporary means needed to prevent discharge of sediment to water courses from dewatering systems or erosion are included in this Section.
   4. No classification of excavated materials will be made. Excavation includes all materials regardless of type, character, composition, moisture, or condition thereof.
   5. CONTRACTOR shall perform all earthwork as specified in this Section.
   6. CONTRACTOR shall conform to the requirements to the local requirements for regrading, grading, erosion and sediment control.
   7. Finished grade shall match existing grade as approved by the Owner.

B. Related Sections:
   1. Section 01410, Testing Laboratory Services.
   2. Section 02050, Demolition, Removal and Disposal.
   3. Section 02110, Clearing and Grubbing
   4. Section 02230, Crushed Stone and Gravel.
   5. Section 15051, Buried Pipe Installation.

1.2 QUALITY ASSURANCE

A. Standard Specification and Details:
   1. CONTRACTOR shall conform to all applicable requirements of the Uniform Standard Specifications for Public Works Construction by the Maricopa Association of Governments (MAG) as follows:
      a. Section 205, Roadway Excavation.
      b. Section 206, Structure Excavation and Backfill.
      c. Section 211, Fill Construction.
      d. Section 225, Watering.
      e. Section 702, Base Materials.
   2. If there is a conflict between the MAG Standard Specifications and these Specifications, the provisions of these Specifications shall govern.

B. Testing Services:
   1. General: Testing of materials, testing for moisture content during placement and compaction of fill materials, and of compaction requirements for compliance with

technical requirements of the Specifications shall be performed by a testing laboratory as designated in Section 01410, Testing Laboratory Services and Section 01411, Testing Laboratory Services Furnished by CONTRACTOR.

2. CONTRACTORS'S Testing Agency Scope:
   a. Test CONTRACTOR'S proposed materials in the laboratory and field for compliance with the Specifications.
   b. Perform field moisture content and density tests to assure that the specified compaction of backfill materials has been obtained.
   c. Report all test results to the OWNER and CONTRACTOR.
3. Authority and Duties of CONTRACTORS'S Testing Agency: Technicians representing the testing laboratory shall inspect the materials in the field and perform tests and shall report their findings to the OWNER and CONTRACTOR. When the materials furnished or Work performed fails to fulfill Specification requirements, the technician will direct the attention of the OWNER and CONTRACTOR to such failure.
   a. The technician shall not act as foreman or perform other duties for CONTRACTOR. Work will be checked as it progresses, but failure to detect any defective Work or materials shall not in any way prevent later rejection when such defect is discovered, nor shall it obligate the OWNER for final acceptance. Technicians are not authorized to revoke, alter, relax, enlarge, or release any requirements of the Contract Documents, nor to approve or accept any portion of the Work.
4. Responsibilities and Duties of CONTRACTOR:
   a. The use of testing services shall in no way relieve CONTRACTOR of the responsibility to furnish materials and construction in full compliance with the Contract Documents.
   b. To facilitate testing services, CONTRACTOR shall:
      1. Secure and deliver to the OWNER or to the testing agency, without cost, preliminary representative samples of the materials he proposes to use and are required to be tested.
      2. Furnish such casual labor as is necessary to obtain and handle samples at the Work site or at other sources of material.
      3. Advise the OWNER'S testing agency sufficiently in advance of operations to allow for completion of quality tests and for the assignment of personnel.
   c. CONTRACTOR'S Testing Service shall inspect and approve subgrades and fill layers before further construction Work is performed thereon.
   d. It shall be the responsibility of CONTRACTOR to accomplish the specified compaction for backfill, fill, and other earthwork. It shall be the responsibility of CONTRACTOR to control his operations by confirmation tests to verify and confirm that he has complied, and is complying at all times, with the requirements of these Specifications concerning compaction, control, and testing.
   e. The frequency of CONTRACTOR'S confirmation tests shall be not less than as follows; each test location for trenches shall include tests for each layer, type, or class of backfill from bedding to finish grade.
      1. For trenches:
         a. In open fields: 2 locations every 1,000 linear feet.
         b. Along dirt or gravel roads or off traveled right-of-way: 2 locations every 500 linear feet.
         c. Crossing paved roads: 2 locations along each crossing.
         d. Under pavement cuts or within 2 feet of pavement edges: I location every 400 linear feet.
      2. For structural backfill: 1 every 20 cubic yards.
      3. In embankment or fill: 1 every 200 cubic yards.

4. Base material: 1 every 50 cubic yards.

f. Copies of the test reports shall be submitted promptly to the OWNER. CONTRACTOR'S tests shall be performed by a soils testing laboratory acceptable to the OWNER.

g. CONTRACTOR shall demonstrate the adequacy of compaction equipment and procedures before exceeding any of the following amounts of earthwork quantities:
   1. 200 linear feet of trench backfill.
   2. 10 cubic yards of structural backfill.
   3. 100 cubic yards of embankment work.
   4. 50 cubic yards of base material.

h. Until the specified degree of compaction on the previously specified amounts of earthwork is achieved, no additional earthwork of the same kind shall be performed.

i. Periodic compliance tests will be made by the OWNER to verify that compaction is meeting the requirements previously specified at no cost to CONTRACTOR. CONTRACTOR shall remove the overburden above the level at which the OWNER wishes to test and shall backfill and recompact the excavation after the test is complete.

j. If compaction fails to meet the specified requirements, CONTRACTOR shall remove and replace the backfill at proper density or shall bring the density up to specified level by other means acceptable to the OWNER. Subsequent tests required to confirm and verify that the reconstructed backfill has been brought up to specified density shall be paid by CONTRACTOR. CONTRACTOR'S confirmation tests shall be performed in a manner acceptable to the OWNER. Frequency of confirmation tests for remedial Work shall be double that amount specified for initial confirmation tests.

C. Permits and Regulations:
   1. Obtain all necessary permits for Work in roads, rights-of-way, railroads, etc. Also obtain permits as required by local, state and federal agencies for discharging water from excavations.
   2. Perform excavation Work in compliance with applicable requirements of governing authorities having jurisdiction.

D. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
   1. ASTM A36, Specification for Structural Steel.
   2. ASTM A328, Specification for Steel Sheet Piling.
   3. ASTM D422, Method for Particle-Size Analysis of Soils.
   4. ASTM D423, Liquid Limit of Soils.
   5. ASTM D427, Shrinkage Factors of Soils.
   6. ASTM D698, Test Method for Laboratory Compaction Characteristics of Soil.
   7. ASTM D 1556, Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
   8. ASTM D2922, Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
   9. AISC Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings.
   10. OSHA Standard, Title 29, Code of Federal Regulations, Part 1926, Section .650 (Subpart P - Excavations).
   11. ASTM D2166, unconfined compressive strength of soils.
   12. Local Construction Code.

1.3 SUBMITTAL

A. Excavation Plan: Prior to start of excavation operations, submit written plan to demonstrate compliance with OSHA Standard 29 CFR Part 1926.650. As a minimum, excavation plan shall include:
   1. Name of competent person.
   2. Excavation method(s) or protective system(s) to be used.
   3. Copies of "manufacturer's data" or other tabulated data if protective system(s) are designed on the basis of such data.

B. CONTRACTOR shall prepare drawings for the following items:
   1. Sheeting and bracing, or other protective system(s).
   2. Dewatering system.
   3. Cofferdams.
   4. Underpinning.

C. Drawings and calculations shall be prepared by a Registered Professional Engineer licensed in the State of Arizona and recognized as expert in the specialty involved. Drawings and calculations shall be submitted to OWNER for record purposes only. Drawing and calculation submittal will not be checked and will not imply approval by OWNER of the Work involved. CONTRACTOR shall be solely responsible for designing, installing, operating and maintaining whatever system is necessary to satisfactorily accomplish all necessary sheeting, bracing, protection, underpinning and dewatering.

D. Test Reports - Borrow, Backfill, and Grading:
   1. Testing laboratory shall submit copies of the following reports directly to OWNER, with one copy to CONTRACTOR:
      a. Tests on borrow material.
      b. Tests on footing subgrade.
      c. Field density tests.
      d. Optimum moisture - maximum density curve for each soil used for backfill.
      e. Reports of observations for conformance of borrow material to the Project Geotechnical Report.

E. Samples of all materials, including select backfill, general backfill, granular embedment, crushed stone, and sand shall be submitted to the OWNER and the testing service. Samples of the proposed material shall be submitted at least fourteen (14) days in advance of its anticipated use.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Backfill and Fill Materials - Walls, Foundations and Piping:
   1. Materials acceptable for use as backfill against walls, foundations and above piping shall be stockpiled native sandy or granular soils obtained from onsite excavations and which are uniformly mixed, contain no organic matter, nor contain rocks or fragments greater than 3-inches in size, nor have greater than 40 percent passing the 200 sieve. The maximum expansion of off-site materials shall be 1.5 percent as performed on a sample

remolded to approximately 95 percent of the maximum dry density as determined in accordance with ASTM D 698 at 2-percent below optimum moisture content under a 100 psi surcharge pressure.

2. Backfill and fill materials from off-site sources shall consist of silty or clayey sand soils which are uniformly mixed, contain no organic matter and which have a Plasticity Index less than ten (10). The maximum particle size of imported soils shall be 4-inches or less, if required to satisfy trenching, landscaping, or other requirements. The maximum expansion of off-site materials shall be 1.5 percent as performed on a sample remolded to approximately 95 percent of the maximum dry density as determined in accordance with ASTM D 698 at 2 percent below optimum moisture content under a 100 psi surcharge pressure.
3. All materials for use as backfill and fill material shall be tested by the laboratory and approved by the OWNER.
4. If on-site material is unsuitable as determined by the OWNER, select backfill or approved off-site fill shall be used.
5. Fill adjacent to structures is classified as backfill to a distance measured horizontally from the structure that is equal to the depth from the finished grade. Outside these limits the fill is classified as embankments, unless otherwise specified.

B. Select Backfill: Select Backfill for use beneath concrete slabs and asphaltic pavements shall be well graded sand and gravel materials conforming to the requirements of Aggregate Base Course (ABC) as specified in Section 702 of the MAG Specifications.

C. Embankments:
1. Fill materials for use as embankments, as fill under paved areas, and as miscellaneous landscaping materials exterior to plant facilities, shall consist of soils obtained from on-site excavations or off-site sources which are uniformly mixed, contain no organic material, rocks or fragments greater than 3-inches in size.
2. All materials for use as described above shall be tested by the laboratory and approved by the OWNER.

D. Crushed Stone and Gravel: Crushed stone shall be crushed rock or gravel conforming to the requirements of Section 02230, Crushed Stone and Gravel.

E. Sand:
1. Sand for use as embedment material around plastic pipes shall consist of natural or manufactured granular material.
2. Sand material shall contain no organic material. Sand shall be nonplastic, when tested in accordance with ASTM D 4318, 100 percent shall pass a ½-inch screen and no more than 20 percent shall pass a No. 200 screen.
3. The sand shall be deposited in uniform layers not to exceed 6-inches in uncompacted thickness. The backfill shall be compacted to not less than 95 percent of laboratory maximum density as determined by ASTM D 698.
4. All material for sand must be tested and approved by the OWNER.
5. No sand shall be placed without the approval of the OWNER.

F. Granular Embedment:
1. Granular embedment material shall be well graded sand and gravel materials and shall conform to the requirements of MAG Specification Section 702, Aggregate Base.

G. Controlled Low Strength Material (CLSM):
1. CLSM shall consist of a mixture of Portland cement, aggregate, fly ash, water and approved admixtures conforming to the following requirements:
    a. Portland Cement: ASTM C150, Type V, 94 lbs minimum per cubic yard.
        i. Aggregate: Clean imported sand and gravel or selected material from the excavation, imported material, or a combination thereof as approved by the OWNER. Maximum aggregate size shall be 1-inch. The soluble sulfate content of the aggregate in the mixture shall not exceed 0.3 percent by dry weight.
        ii. Water: Potable quality.
        iii. Fly Ash: Class C, ASTM C618, or approved by OWNER.
        iv. The minus 200 sieve fraction shall be nonplastic, as defined by ASTM D4318.
    b. Proportion the CLSM to be flowable, nonsegregating, self-consolidating low shrink slurry. The CONTRACTOR shall determine the materials and proportions used to meet the requirements of the Specifications.
    c. The unconfined compressive strength at 28 days shall be a minimum of 100 psi and a maximum of 300 psi.
    d. The temperature of the CLSM discharged into the trench shall be below 85-degrees F.

PART 3 - EXECUTION

3.1 INSPECTION

A. Provide OWNER with sufficient notice and with means to examine the areas and conditions under which excavating, filling, and grading are to be performed. OWNER will notify CONTRACTOR if conditions are found that may be detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to OWNER.

3.2 TEST PITS

A. General: CONTRACTOR shall excavate and backfill, in advance of the construction, test pits to determine conditions or location of the existing utilities and structures. CONTRACTOR shall perform all Work required in connection with excavating, stockpiling, maintaining, sheeting, shoring, backfilling and replacing pavement for the test pits.
1. CONTRACTOR shall be responsible for the definite location of each existing facility involved within the area of his excavation for Work under this Contract. Care shall be exercised during such location work to avoid damaging and disrupting the affected facility. CONTRACTOR shall be responsible for repairing, at his sole expense, damage to any structure, piping, or utility caused by his Work.

3.3 EXCAVATION

A. Perform all excavation required to complete the Work as shown, specified and required. Excavations shall include earth, sand, clay, gravel, hardpan, boulders, rock, pavements, rubbish and all other materials within the excavation limits.

B. Excavations for structures and pipelines shall be open excavations. Provide excavation protection systems required by ordinances, codes, law and regulations to prevent injury to workmen and to prevent damage to new and existing structures or pipelines.

C. Where the structure or pipeline is to be placed below the ground water table, well points, cofferdams or other, acceptable methods shall be used to permit construction of said structure or pipeline under dry conditions. Dry conditions shall prevail until concrete has reached sufficient strength to withstand earth and hydrostatic loads and until the pipelines are properly jointed, tested and backfilled. In addition, protect excavation from flooding until all walls and floor framing up to and including grade level floors are in place and backfilling has begun. Water level shall be maintained below top of backfill at all times.

D. Pumping of water from excavations shall be done in such a manner to prevent the carrying away of unsolidified concrete materials and to prevent damage to the existing subgrade.

E. The elevation of the bottom of footings shown shall be considered as approximate only and OWNER may order such changes in dimensions and elevations as may be required to secure a satisfactory footing. All structure excavations shall be hand-trimmed to permit the placing of fall widths and lengths of footings on horizontal beds. Rounded and undercut edges will not be permitted.

F. When excavations are made below the required grades, without the written order of OWNER, they shall be backfilled with compacted select fill or concrete, as directed by OWNER, at the sole expense of CONTRACTOR.

G. Excavations shall be extended sufficiently on each side of structures, footings, etc., to permit setting of forms, installation of shoring or bracing or the safe sloping of banks.

H. Subgrades for roadways, structures and trench bottoms shall be firm, dense, and thoroughly compacted and consolidated; shall be free from mud, muck, and other soft or unsuitable materials; and shall remain firm and intact under all construction operations. Subgrades which are otherwise solid, but which become soft or mucky on top due to construction operations, shall be reinforced with select fill. The finished elevation of stabilized subgrades shall not be above subgrade elevations shown.

I. Pipe Trench Preparation:
   1. No more than 100 feet of trench may be opened in advance of pipe laying.
   2. Trench width shall be minimized to greatest extent practical but shall conform to the following:
      a. Sufficient to provide room for installing, jointing and inspecting piping, but in no case wider at top of pipe than pipe barrel outside diameter plus 3 feet.
      b. Enlargements at pipe joints may be made, if required, and approved by OWNER.
      c. Sufficient for shoring and bracing, or shielding and dewatering.
      d. Sufficient to allow thorough compaction of backfill adjacent to bottom half of pipe.
      e. Do not use excavating equipment that requires the trench to be excavated to excessive width.
   3. Depth of trench shall be as shown or directed by the OWNER. If required and approved by OWNER, depths may be revised.

J. Material Storage: Stockpile satisfactory excavated materials in approved areas, until required for backfill or fill. Place, grade and shape stockpiles for proper drainage.

1. Locate and retain soil materials away from edge of excavations.
2. Dispose of excess soil material and waste materials as specified hereinafter.
3. Stockpiled excavated soils for use as subsequent fill shall be classified by laboratory as on-site granular or sandy soils. Use and placement of fill shall be performed as specified for each class.
4. Excess soil from excavations shall be disposed of off-site. Disposal shall be in accordance with state and local regulatory requirements.

K. Where OWNER considers the existing material beneath the bedding material unsuitable, CONTRACTOR shall remove same and replace it with select backfill.

3.4 UNAUTHORIZED EXCAVATION

A. All excavation outside the lines and grades shown, and which is not approved by OWNER, together with the removal and disposal of the associated material shall be at CONTRACTOR'S expense. Unauthorized excavations shall be filled and compacted with select backfill by CONTRACTOR at his sole expense.

3.5 EROSION CONTROL AND DEWATERING

A. Erosion Control:
   1. In general, the construction procedures outlined herein shall be implemented to assure minimum damage to the environment during construction. CONTRACTOR shall take any and all additional measures required to conform to the requirements of applicable codes and regulations.
   2. Whenever possible, access and temporary roads shall be located and constructed to avoid environmental damage. Provisions shall be made to regulate drainage, avoid erosion and minimize damage to vegetation.
   3. Where areas must be cleared for storage of materials or temporary structures, provisions shall be made for regulating drainage and controlling erosion, subject to the OWNER'S approval.
   4. Temporary measures shall be applied to control erosion and to minimize the siltation of the existing waterways, and natural ponding areas. Such measures shall include, but are not limited to, the use of berms, baled straw silt barriers, gravel or crushed stone, mulch, slope drains and other methods. These temporary measures shall be applied to erodible materials exposed by any activities associated with the construction of this Work.
      a. Special care shall be taken to eliminate depressions that could serve as mosquito pools.
      b. Temporary measures shall be coordinated with the construction of permanent drainage facilities and other Work to the extent practicable to assure economical, effective, and continuous erosion and siltation control.
      c. CONTRACTOR shall provide special care in areas with steep slopes. Disturbance of vegetation shall be kept to a minimum to maintain stability.
   5. Remove only those shrubs, grasses and cacti that must be removed for construction. Protect the remainder to preserve their erosion-control value.
   6. Install erosion and sediment control practices where required and according to applicable standards, codes and specifications. The practices shall be maintained in effective working condition during construction and until the drainage area has been permanently stabilized.
   7. Mulching to be used for temporary stabilization.

a. Suitable Materials for Mulching:
    1. Unrotted straw or salt hay - 1-1/2 to 2 tons/acre.
    2. Asphalt emulsion or cutback asphalt - 600 to 1200 gal./ acre.
    3. Wood-fiber or paper-fiber (hydroseeding) - 1500 lbs./ acre.
    4. Mulch netting (paper, jute, excelsior, cotton or plastic).
b. Straw or salt hay mulches should be immediately anchored using peg and twine netting or a mulch anchoring tool or liquid mulch binders.

8. After stabilization, remove all straw bale dikes, debris, etc., from the site.
9. In the event of any temporary Work stoppage, CONTRACTOR shall take steps any temporary or environmental damage to the area undergoing construction.
10. In the event CONTRACTOR repeatedly fails to satisfactorily control erosion and siltation, the OWNER reserves the right to employ outside assistance or to use its own forces to provide the corrective measures indicated. The cost of such work, plus engineering costs, will be deducted from monies due CONTRACTOR.
11. CONTRACTOR shall prevent blowing and movement of dust from exposed soil surfaces and access roads to reduce on and off-site damage and health hazards. Control may be achieved by irrigation in which the site shall be sprinkled with water until the surface is moist. The process shall be repeated as needed.

B. Dewatering:
1. CONTRACTOR shall provide and maintain adequate dewatering equipment to remove and dispose of all surface water and ground water entering excavations, trenches, or other parts of the Work. Each excavation shall be kept dry during subgrade preparation and continually thereafter until the structure to be built, or the pipe to be installed therein is inspected by the OWNER and backfill operations have been completed and approved.
    a. The different working areas on the site shall be kept free of surface water at all times. CONTRACTOR shall install drainage ditches and dikes and shall perform all pumping and other Work necessary to divert or remove rainfall and all other accumulations of surface water from the excavations and fill areas. The diversion and removal of surface water shall be performed in a manner that will prevent the accumulation of water behind temporary structures or at any other locations within the construction area where it may be detrimental.
    b. Water used for working or processing, resulting from dewatering operations, or containing oils or sediments that will reduce the quality of the water downstream of the point of discharge, shall not be directly discharged. Such waters shall be diverted through a settling basin or filter before being discharged.
    c. CONTRACTOR will be held responsible for the condition of any pipe, conduit or channel used for drainage purposes and all such pipes, conduits or channels shall be left clean and free of sediment.

C. Disposal of Water Removed by Dewatering System:
1. Dispose of all water removed from the excavation in such a manner as not to endanger public health, property, or any portion of the Work under construction or completed.
2. Dispose of water in such a manner as to cause no inconvenience to OWNER, or others involved in Work about the site.
3. Convey water from the construction site in a closed conduit. Do not use trench excavations as temporary drainage ditches.
4. CONTRACTOR'S Dewatering System shall discharge to an appropriate location, in accordance with State and Federal regulations.

3.6 SHEETING, SHORING AND BRACING

A. General:
   1. Used material shall be in good condition, not damaged or excessively pitted. All steel or wood sheeting designated to remain in place shall be new. New or used sheeting may be used for temporary Work.
   2. All timber used for breast boards (lagging) shall be new or used, meeting the requirements for Douglas Fir Dense Construction grade with a bending strength not less than 1500 psi or Southern Pine No. 2 Dense.
   3. All steel Work for sheeting, shoring, bracing, cofferdams etc., shall be designed in accordance with the provisions of the "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings" of the AISC, except that field welding will be permitted.
   4. Steel sheet piling shall be manufactured from steel conforming to ASTM A 328. Steel for soldier piles, wales and braces shall be new or used and shall conform to ASTM A 36.
   5. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Carry down shoring and bracing as excavation progresses.
   6. Unless otherwise shown, specified, or ordered, all materials used for temporary construction shall be removed when Work is completed. Such removal shall be made in a manner not injurious to the structure or its appearance or to adjacent Work.
   7. Provide permanent steel sheet piling as shown or required. Cut off tops, as required, but at least 3 feet below grade.
   8. The clearances and types of the temporary structures, insofar as they affect the character of the finished Work and the design of sheeting to be left in place, shall be subject to the approval of OWNER; but CONTRACTOR shall be responsible for the adequacy of all sheeting, shoring, bracing, cofferdamming, etc.
   9. Safe and satisfactory sheeting, shoring and bracing shall be the entire responsibility of CONTRACTOR.
   10. All municipal, county, state and federal ordinances, codes, regulations and laws shall be observed.

B. Sheeting Left in Place:
   1. Steel sheet piling to be left in place shall consist of rolled sections of the continuous interlocking type, unless otherwise approved. The type and design of the sheeting and bracing shall conform to the above specifications for all sheeting and bracing steel Work. Steel sheeting left in place shall be new.
   2. Steel sheet piling to be left in place shall be driven straight to the lines and grades as shown or directed. The piles shall penetrate into firm materials with secure interlocking throughout the entire length of the pile. Damaged piling having faulty alignment shall be pulled and replaced by new piling.
   3. The type of guide structure used and method of driving for steel sheet piling to be left in place shall be subject to the approval of OWNER. Jetting will not be permitted.
   4. Cut-off piling left in place to the grades shown or ordered by OWNER and remove the cut-offs from the site.
   5. Clean wales, braces and all other items to be embedded in the permanent structure, and ensure that the concrete surrounding the embedded element is sound and free from air pockets or harmful inclusions. Provisions shall include the cutting of holes in the webs and flanges of wale and bracing members and the welding of steel diaphragm waterstops perpendicular to the centerline of brace ends which are to be embedded.
   6. Subsequent to removal of the inside face forms, and when removal of bracing is permitted, cut back steel at least 2-inches inside the wall face and patch opening with

cement mortar. Concrete shall be thoroughly worked beneath wales and braces, around stiffeners and in any other place where voids may be formed.

7. Portions of sheeting or soldier piles and breast boards, which are in contact with the foundation concrete, shall be left in place together with wales and bracing members cast into foundation or superstructure concrete.

C. Removal of Sheeting and Bracing:
   1. Remove sheeting and bracing from excavations, unless otherwise directed in writing by OWNER. Removal shall be done so as to not cause injury to the Work. Removal shall be equal on both sides of excavation to ensure that no unequal loads are placed on pipe or structure.
   2. Defer removal of sheeting and bracing where removal may cause soil to come into contact with concrete until the following conditions are satisfied:
      a. Concrete has cured a minimum of seven (7) days.
      b. Wall and floor framing, up to and including, grade level floors are in place.

3.7 TRENCH SHIELDS

A. Excavation of earth material below the bottom of a shield shall not exceed the limits established by ordinances, codes, laws and regulations.

B. When using a shield for pipe installation:
   1. Any portion of the shield that extends below the mid-diameter of an installed rigid pipe (e.g., PCCP, etc.) shall be raised above this point prior to moving the shield ahead for the installation of the next length of pipe.
   2. The bottom of the shield shall not extend below the mid-diameter of installed flexible pipe (e.g., Steel, Ductile Iron, PVC, etc.) at any time.

C. When using a shield for the installation of structures, the bottom of the shield shall not extend below the top of the bedding for the structures.

D. When a shield is removed or moved ahead, extreme care shall be taken to prevent the movement of pipe or structures or the disturbance of the bedding for pipe or structures. Pipe or structures that are disturbed shall be removed and reinstalled as specified.

3.8 PLACEMENT OF FILL AND BACKFILL

A. General:
   1. All select backfill and backfill required for structures and trenches and required to provide the finished grades shown and as described herein shall be furnished, placed and compacted by CONTRACTOR.
   2. Backfill excavations as promptly as Work permits, but not until completion of the following:
      a. Acceptance by the OWNER of construction below finish grade.
      b. Inspection, testing, approval, and recording of locations of underground piping and ductwork.
      c. Removal of concrete formwork.
      d. Removal of shoring and bracing, and backfilling of voids with satisfactory materials.
      e. Removal of trash and debris.
      f. Acceptance of hydraulic testing.

3. Fill containing organic materials or other unacceptable material shall be removed and replaced with approved fill material as specified.

B. Placement of Select Backfill, Backfill and Fill:
   1. Select backfill shall be placed to the grades shown on the Drawings. The lift thickness and compaction moisture content range given herein are approximate. These values shall be finally determined from the laboratory test results on the fill materials.
   2. All select backfill shall be placed in horizontal loose lifts, not exceeding 8-inches in thickness, and shall be mixed and spread in a manner assuring uniform lift thickness after placing. Each lift shall be compacted by not less than two complete coverages of the specified compactor. Select backfill shall be placed to the underside of all concrete slabs. The fill material shall extend a minimum of two feet outside the face of each structure and be 12-inches below finished grade. The maximum slope of select backfill to the subgrade shall be one vertical to one horizontal.
   3. Backfill and fill around and outside of structures and over select backfill shall be deposited in layers not to exceed 8-inches in non-compacted thickness and mechanically compacted, using platform type tampers. Compaction of structures backfilled by rolling will be permitted provided the desired compaction is obtained and damage to the structure is prevented. Compaction of select backfill or backfill by inundation with water will not be permitted. All materials shall be deposited as specified and as shown on the Drawings.
   4. The material shall be placed at a moisture content and density as specified under Paragraph 3.8.G. CONTRACTOR shall provide equipment capable of adding measured amounts of water to the backfill or select backfill material to bring it to a condition within the range of the required moisture content. CONTRACTOR shall provide equipment capable of discing, aerating, and mixing the soil to ensure reasonable uniformity of moisture content throughout the fill material and to reduce the moisture content of the borrow material by air drying, if necessary. If the subgrade or lift of earth material must be moisture conditioned before compaction, the fill material shall be sufficiently mixed or worked on the subgrade to ensure a uniform moisture content throughout the lift of material to be compacted. Materials at moisture content in excess of the specified limit shall be dried by aeration or stockpiled for drying.
   5. No backfill or fill material shall be placed when free water is standing on the surface of the area where the fill is to be placed. No compaction of fill will be permitted with free water on any portion of the fill to be compacted. No fill shall be placed or compacted in a frozen condition or on top of frozen material. Any fill containing organic materials or other unacceptable material previously described shall be removed and replaced with approved fill material prior to compaction.
   6. Compaction shall be performed with equipment suitable for the type of fill material being placed. CONTRACTOR shall select equipment capable of providing the minimum density required by these Specifications. Hand operated compacting equipment shall be used within a distance of 10 feet from the wall of any completed below grade structure. Equipment shall be provided capable of compacting in restricted areas next to structures and around piping. The effectiveness of the equipment selected by CONTRACTOR shall be tested at the commencement of compacted fill Work by construction of a small section of fill within the area where fill is to be placed. If tests on this section of fill show that the specified compaction is not obtained, CONTRACTOR shall increase the amount of coverages, decrease the lift thicknesses and/or obtain a different type of compactor.
   7. Levels of backfill against concrete walls shall not differ by more than two (2) feet on either side of walls, unless walls are adequately braced or all floor framing is in place up to and including grade level slabs. Particular care shall be taken to compact structure

backfill beneath pipes, roads, or other surface construction or structures. In addition, wherever a trench passes through structure backfill, the structure backfill shall be placed and compacted to an elevation 12-inches above the top of the pipe before the trench is excavated. Compacted areas, in each case, shall be adequate to support the item to be constructed or placed thereon.

8. The compaction requirements specified are predicated on the use of normal materials and compaction equipment. In order to establish criteria for the placement of a controlled fill so that it will have compressibility and strength characteristics compatible with the proposed structural loadings, a series of laboratory compaction and compressive strength tests shall be performed on the samples of materials submitted by CONTRACTOR. From the results of the laboratory tests, the final values of the required percent compaction, the acceptable compaction moisture content range, and the maximum permissible lift thickness will be established for the fill material and construction equipment proposed.

C. Backfill in Pipe Trenches:
   1. Pipeline trenches may be backfilled prior to pressure testing, but no structure shall be constructed over any pipeline until it has been tested.
   2. All pipe, except plastic pipe, shall be placed on a minimum 6-inch thick layer of granular embedment material. The granular embedment material shall extend 12-inches above the top of the pipe. CPVC and PVC pipes shall be placed on a minimum 6-inch layer of sand. Sand shall extend to 12-inches above top of pipe, and to the trenchwalls on each side of the pipe.
   3. Embedment materials both below and above the bottom of the pipe, classes of embedment to be used, and placement and compaction of embedment materials shall conform to the following requirements:
      a. Granular embedment shall be spread and the surface graded to provide a uniform and continuous support beneath the pipe at all points between bell holes or pipe joints. It will be permissible to slightly disturb the finished subgrade surface by withdrawal of pipe slings or other lifting tackle. After each pipe has been graded, aligned, placed in final position on the bedding material and shoved home, sufficient pipe embedment material shall be deposited and compacted under and around each side of the pipe and back of the bell or end thereof to hold the pipe in proper position and to maintain alignment during subsequent pipe jointing and embedment operations. Embedment material shall be deposited and compacted uniformly and simultaneously on each side of the pipe to prevent lateral displacement. The embedment material shall then be placed and compacted to an elevation 12-inches above the top of pipe.
      b. Compacted backfill shall be required for the full depth of the trench above the granular pipe embedment material. Where the trench for one pipe passes beneath the trench for another pipe or electrical ductbank, the lower trench shall be compacted to the level of the bottom of the upper trench.
      c. Each layer of embedment material shall be compacted by at least two complete coverages of all portions of the surface of each lift using approved compaction equipment. One coverage is defined as the conditions reached when all portions of the fill lift have been subjected to the direct contact of the compacting surface of the compactor.
      d. The method of compaction and the equipment used shall be appropriate for the material to be compacted and shall not transmit damaging shocks to the pipe.
      e. The degree of compaction required for granular embedment is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 698.

D. Backfill in Electrical Ductbank Trenches:
   1. Compacted backfill shall be required for the full depth of the trench above the electrical ductbank. Where the trench for one ductbank passes beneath the trench for another pipe or ductbank select backfill shall be placed to the level of the bottom of the upper trench.
   2. Placement and compaction of backfill in electrical ductbank trenches shall conform to the requirements of Paragraph 3.8.B.

E. Crushed Stone Placement:
   1. Crushed stone shall be placed where shown on the Drawings to the limits shown, as required and directed.
   2. Crushed stone shall be place in hand tamped lifts, not to exceed 6-inches.

F. Sand Placement:
   1. Sand shall be placed as an envelope around PVC and CPVC pipes and all pipe 2-inches and smaller. Place and compact minimum 6-inches of sand all around pipes, in 6-inch lifts, to a level 6-inches above the top of pipe.

G. Compaction Density Requirements:
   1. The degree of compaction required for all types of fills shall be as listed below. Material shall be moistened or aerated as necessary to provide the moisture content that will facilitate obtaining the specified compaction.

Material Thick (in)	Required Minimum Density-Percent Compaction (ASTM D-698)	*Maximum Uncompacted Lift(inches)
Subgrade and Subbase Fill:		
Below concrete slabs on grade	95	8
Below base of footings or mats, structural slabs and tank floors	95	8
Below asphalt concrete paving	95	12
**Structural Backfill:		
More than 5 feet below final grade	100	8
Less than 5 feet below grade	95	8
Aggregate Base Course:		
Below concrete slabs or mats	95	8
Below asphalt and decomposed granite paving	100	8
Trench Backfill above pipe	95	12
Granular Pipe Embedment Material	95	6
Sand Embedment Material	95	6

* Where applicable
** Structural backfill shall not be used for support of facilities which are susceptible to damage from differential settlement of the fill section relative to walls.

All fill must be wetted and thoroughly mixed to achieve optimum moisture content, ± 3 percent, with the following exceptions: On site clayey soils optimum to plus 3 percent.

Natural undisturbed soils or compacted soil subsequently disturbed or removed by construction operations shall be replaced with materials compacted as specified above.

2. CONTRACTOR'S testing service shall perform tests necessary to provide data for selection of fill material and control of placement water content.
3. Field density tests, to ensure that the specified density is being obtained, shall be performed by CONTRACTOR'S testing service during each day of compaction Work.
4. If the tests indicate unsatisfactory compaction, CONTRACTOR shall provide the additional compaction necessary to obtain the specified degree of compaction. All additional compaction Work shall be performed by CONTRACTOR, at no additional cost to the OWNER, until the specified compaction is obtained. This Work shall include complete removal of unacceptable (as determined by the OWNER) fill areas and replacement and recompaction until acceptable fill is provided.

H. Replacement of Unacceptable Excavated Materials: In cases where over-excavation for the replacement of unacceptable soil materials is required, the excavation shall be backfilled to the required subgrade with select backfill material and thoroughly compacted as specified in Paragraph 3.8.G. Sides of the excavation shall be sloped in accordance to the maximum inclinations specified for each structure location.

3.9 EMBANKMENTS

A. To the maximum extent available, use excess earth obtained from structure and trench excavations for construction of embankments. Obtain additional material from borrow pits, as necessary. After preparation of the embankment area, level and roll the subgrade so that surface materials of the subgrade will be compact and well bonded with the first layer of the embankment. All material deposited in embankments shall be free from rocks or stones, brush, stumps, logs, roots, debris, and organic or other objectionable materials. Construct embankments in horizontal layers not exceeding 8-inches in uncompacted thickness. Spread and level material deposited by excavating and hauling equipment prior to compaction. Thoroughly compact each layer by rolling, or other method acceptable to the OWNER, to 95 percent of the maximum density at optimum moisture content, as determined by ASTM D 698. If the material fails to meet the density specified, compaction methods shall be altered. Wherever a trench passes through a fill or embankment, the fill or embankment material shall be placed and compacted to an elevation 24-inches above the top of the pipe before the trench is excavated.

3.10 GRADING

A. General: Uniformly grade areas within limits of grading under this Section, including adjacent transition areas. Smooth subgrade surfaces within specified tolerances, and compact with uniform levels or slopes between points where elevations are shown or between such points and existing grades.

B. Grading Outside Building Lines: Grade areas adjacent to building lines to drain away from structures and to prevent ponding, as follows:
1. Turf Areas or Areas Covered with Gravel, Stone, Wood Chips, or Other Special Cover: Finish areas to receive topsoil or special cover to within not more than 1-inch above or below the required subgrade elevations.
2. Walks: Shape surface of areas under walks to line, grade and cross-section, with finish surface not more than 1-inch above or below the required subgrade elevation.

3. Pavements: Shape surface of areas under pavement to line, and grade and cross-section with finish surface not more than 1/2-inch above or below the required subgrade elevation.

C. Grading Surface of Fill Under Building Slabs: Grade smooth and even, free of voids, compacted as specified and to required elevation. Provide final grades within a tolerance of 1/2-inch when tested with a 10-foot straightedge.

D. Compaction: After grading, compact subgrade surfaces to the depth and percentage of maximum density for each area classification.

3.11 PAVEMENT BASE COURSE

A. General: Place subbase material, in layers of specified thickness, over ground surface to support pavement base course.
   1. Refer to Section 02513, Decomposed Granite Pavement and the Drawings.

B. Grade Control: During construction, maintain lines and grades including crown and cross-slope of subbase course.

C. Shoulders: Place shoulders along edges of base course to prevent lateral movement. Construct shoulders of acceptable soil materials, placed in such quantity to compact to thickness of each base course layer. Compact and roll at least a 12-inch width of shoulder simultaneously with compacting and rolling of each layer of base course.

D. Placing: Place base course material on prepared subgrade in layers of uniform thickness conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting base material during placement operations.
   1. When a compacted base course is shown to be 6-inches thick or less, place material in a single layer. When shown to be more than 6-inches thick, place material in equal layers, except no single layer shall be more than 6-inches or less than 3-inches in thickness when compacted.

3.12 DISPOSAL OF EXCAVATED MATERIALS

A. Material removed from the excavations, which does not conform to the requirements for fill or is in excess of that required for backfill, shall be hauled away from the Work site and disposed of by CONTRACTOR in compliance with ordinances, codes, laws and regulations at no additional cost to the OWNER.

3.13 RESTORING AND RESURFACING EXISTING ROADWAYS AND FACILITIES

A. Place 1-1/2-inches of temporary similar material pavement immediately after backfilling trenches in paved roadways. Maintain the surface of the paved area over the trench in good and safe condition during progress of the entire Work, and promptly fill all depressions over and adjacent to the trench caused by settlement of backfill. The permanent replacement pavement shall be equal to that of the existing roadways, unless otherwise specified.

B. Pavement, gutters, curbs, sidewalks and roadways disturbed or damaged by CONTRACTOR'S operations shall be restored by CONTRACTOR at their own expense to

as good condition as was previous to the commencement of the Work and in accordance with applicable local and state highway specifications.

3.14 TEMPORARY FENCING

A. CONTRACTOR shall furnish and install an 8-foot tall temporary fence surrounding his excavations and the complete work area, including the stock pile and storage areas. Fence shall have openings only at vehicular, equipment and worker access points.

3.15 FIELD QUALITY CONTRQL

A. Quality Control Testing During Construction: CONTRACTOR'S testing service shall inspect and approve subgrades and fill layers before construction Work is performed thereon. Tests of subgrades and fill layers shall be taken as follows:
   1. Footing Subgrade: For each strata of soil on which footings will be placed, conduct at least one (1) test to verify required design bearing capacities. Subsequent verification and approval of each footing subgrade may be based on a visual comparison of each subgrade with related tested strata, when acceptable to OWNER.
   2. Paved Areas and Building Slab Subgrade: Make at least one (1) field density test of subgrade for every 500 square feet of paved area or building slab, but in no case less than three (3) tests. In each compacted fill layer, make one field density test for every 2000 square feet of overlaying building slab or paved area, but in no case less than three (3) tests.
   3. Foundation Wall Backfill: Take at least two (2) field density tests, at locations and elevations as directed.

B. If testing service reports or inspections show subgrade or fills are below specified density, CONTRACTOR shall provide additional compaction and testing at no additional expense to OWNER. This Work shall include complete removal of unacceptable fill areas (as determined by the OWNER), and replacement and recompaction until acceptable fill is provided.

+ + END OF SECTION + +

SECTION 02230

CRUSHED STONE AND GRAVEL

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment and incidentals required to furnish and install crushed stone and gravel of the types specified at locations shown and as directed by the ENGINEER.

B. Related Sections:
   1. Section 02220, Excavation and Backfill.
   2. Section 15051, Buried Piping Installation.

1.2 QUALITY ASSURANCE

A. CONTRACTOR shall conform to all applicable requirements of Section 701 of the Uniform Standard Specifications for Public Works Construction by the Maricopa Association of Government (MAG). Where there is a conflict between MAG Standard Specifications and these Specifications, the provisions of these Specifications shall govern.

1.3 SUBMITTAL

A. CONTRACTOR shall furnish representative samples of the crushed stone and gravel to the ENGINEER and shall advise of the source location.

B. Test reports showing material compliance with specified requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Crushed Stone or Screened Gravel:
   1. CONTRACTOR shall furnish and place crushed stone or screened gravel fill under pipe or structures where shown in addition to that required under other Sections.
   2. The material shall be well-graded, clean, screened gravel or crushed stone obtained from an approved source. Material shall conform to the following:

Sieve Size (Inch)	Percent Retained on Sieve
2	0
1 ½	0-10
1	45-75
¾	90-100
½	95-100

PART 3 - EXECUTION

3.1 PLACING

A. Gravel shall be spread in layers of uniform thickness not exceeding 6-inches and shall be thoroughly compacted with suitable power driven tampers or other power driven equipment. The placing of crushed stone or gravel shall conform to applicable requirements of Section 02220, Excavation and Backfill, except as noted above.

++ END OF SECTION ++

SECTION 02537

PRECAST STRUCTURES

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Precast concrete structures for the effluent splitter structure and the parshall flume vault.

1.2 REFERENCES

A. Where applicable, the latest editions of the following standards shall form a part of this specification to the extent referenced.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

Standard Specifications for Highway Bridges

AASHTO LRFD Bridge Design Specification

ACI INTERNATIONAL (ACI)

ACI 211.1	Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
ACI 211.2	Standard Practice for Selecting Proportions for Structural Lightweight Concrete
ACI 304R	Guide for Measuring, Mixing, Transporting, and Placing Concrete
ACI 305R	Hot Weather Concreting
ACI 306R	Cold Weather Concreting
ACI 309R	Consolidation of Concrete
ACI 318	Building Code Requirements for Structural Concrete
ACI 350	Code Requirements for Environmental Engineering Concrete Structures and Commentary
ACI 517.2R	Accelerated Curing of Concrete at Atmospheric Pressure

AMERICAN NATIONAL STANDARDS INSTITUTE (ASTM)

ASTM A 36	Specification for Carbon Structural Steel

ASTM A 82	Specification for Steel Wire, Plain, for Concrete Reinforcement
ASTM A 615	Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM C 31	Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C 33	Specification for Concrete Aggregates
ASTM C 39	Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C 40	Test Method for Organic Impurities in Fine Aggregates for Concrete
ASTM C 70	Standard Test Method for Surface Moisture in Fine Aggregate
ASTM C 117	Standard Test Method for Materials Finer than 75- μm (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C 123	Standard Test Method for Lightweight Particles in Aggregate
ASTM C 136	Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM C 138	Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
ASTM C 150	Specifications for Portland Cement
ASTM C 172	Standard Practice for Sampling Freshly Mixed Concrete
ASTM C 192	Practice for Making and Curing Concrete Test Specimens in the Laboratory
ASTM C 231	Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C 260	Specification for Air-Entraining Admixtures for Concrete
ASTM C 494	Standard Specification for Chemical Admixtures for Concrete
ASTM C 566	Test Method for Total Evaporable Moisture content of Aggregate by Drying
ASTM C 595	Specification for Blended Hydraulic Cements
ASTM C 617	Standard Practice for Capping Cylindrical Concrete Specimens
ASTM C 618	Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete
ASTM C 805	Test Method for Rebound Number of Hardened Concrete

ASTM C 857	Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures
ASTM C 858	Specification for Underground Precast Concrete Utility Structures
ASTM C 890	Practice for Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures
ASTM C 891	Practice for Installation of Underground Precast Concrete Utility Structures
ASTM C 913	Specification for Precast Concrete Water and Wastewater Structures
ASTM C 920	Specification for Elastomeric Joint Sealants
ASTM C 990	Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
ASTM C 1037	Practice for Inspection of Underground Precast Concrete Utility Structures
ASTM C 1064	Standard Test Method for Temperature of Freshly Mixed Concrete
ASTM C 1107	Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
ASTM C 1231	Standard Practice for Use of Unbonded Caps in Determination of Compressive Strength of Hardened Concrete Cylinders
ASTM C 1240	Standard Specification for Use of Silica Fume for Use as a Mineral Admixture in Hydraulic-Cement Concrete, Mortar, and Grout
ASTM C 1260	Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
ASTM C 1293	Standard Test Method for Determination of Length Change of Concrete due to Alkali-Silica Reaction
ASTM C 1602	Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
ASTM C 1611	Standard Test Method for Slump Flow of Self- Consolidating Concrete

CONCRETE REINFORCING STEEL INSTITUTE (CRSI)

Manual of Standard Practice

Placing Reinforcing Bars

NATIONAL PRECAST CONCRETE ASSOCIATION (NPCA)

NPCA QC Manual	Quality Control Manual for Precast Concrete Plants

1.3 GENERAL REQUIREMENTS

A. Precast concrete units shall be designed and fabricated by an experienced and acceptable precast concrete manufacturer. The manufacturer shall have been regularly and continuously engaged in the manufacture of precast concrete units similar to that indicated in the project specifications. In addition, the manufacturer shall employ a professional engineer registered in Arizona.

1.4 SUBMITTALS

The following items shall be submitted unless specified otherwise herein

A. Preconstruction Submittals
   1. Upon request by the customer, submit quality control procedures established by the precast manufacturer's Quality Control Manual.

B. General
   1. Submit Four (4) copies or electronic version of complete project submittals for the Engineer's review and Approval. The submittal shall be assembled in a permanent binder, complete with index and cover, clearly identifying the Project Title, Customer, Project Engineer and submittal date. The submittal shall be compiled in a logical and organized manner.
   2. Partial or incomplete submittals will not be reviewed, but instead will be returned as "Incomplete- Revise and Resubmit".
   3. Product Data: Submit manufacturer's specific technical product data, including installation and start up instructions, furnished specialties and accessories, and pump characteristic performance curves with selection points clearly indicated. Provide structural calculations stamped by a Professional Engineer registered in the State the project is being installed.

C. Drawings
   1. Submit manufacturer's assembly-type shop drawings indicating dimensions, mechanical & electrical components, complete bill of materials, structural layout & reinforcing per calculations and structural weights. Structural reinforcing drawings shall be stamped by a Professional Engineer registered in the State the project is being installed.
   2. The drawings for precast concrete units shall be furnished by the precast concrete producer for approval. These drawings shall show the design loads and standards have been met. Installation and construction information shall be included on shop drawings upon request. It is the responsibility of the project's engineer-of-record to verify that the design assumptions are suitable for the proposed application.
   3. For custom made precast concrete units, in addition to the requirements in B.1, the drawing for submittal shall show locations and dimensions to all penetrations and special embed items. Product dimensions and thicknesses shall be shown, and the drawing shall be to a common architectural scale with the precast producer's information in the title block.

D. Precast Concrete Unit Data
   1. Anchorage, Lifting Inserts and Devices
      i. For anchors, lifting inserts and other devices, the precast concrete producer shall provide product data sheets and proper installation instructions upon request.
   2. Accessory Items
      i. For items including, but not limited to sealants, gaskets, pipe entry connectors, gate or hatch openings, steps, racks, and other items installed before or after delivery, the precast concrete producer shall include proper installation instructions and relevant product data upon request.

E. Design Data
   1. The precast concrete producer shall supply submittals showing design loading and material specifications for supplied products. At a minimum, the following shall be shown on the submittals:
      i. Live load used in design
      ii. Vertical and lateral earth loads used in design
      iii. Depth of soil fill on the structure
      iv. Water table depth used in calculations
   2. Upon request, the precast concrete producer shall supply precast concrete unit design calculations and concrete mix design proportions and appropriate mix design test data. Structural design calculations shall be sealed by a licensed professional engineer in the state of this project.

F. Test Reports
   1. Upon request, the precast concrete producer shall supply copies of material certifications and/or laboratory test reports, including mill tests and all other test data, for Portland cement, blended cement, pozzolans, ground granulated blast-furnace slag, silica fume, aggregate, admixtures, and curing compound proposed for use on this project.
   2. Upon request, the precast concrete producer shall submit copies of test reports showing that the mix has been successfully tested to produce concrete with the properties specified and will be suitable for the project conditions. Such tests may include compressive strength, plastic air content, temperature of freshly mixed concrete, and slump of freshly mixed concrete. Special tests for precast concrete items shall be clearly detailed in the specifications.
   3. Upon request, the precast concrete producer shall supply copies of in-plant QA/QC inspection reports.

1.5. DESIGN

The pre-cast concrete structures shall be designed for all stresses that may occur during continuous operation, and for any additional stresses that may occur during fabrication or erection. Workmanship shall be high quality in all respects. All equipment shall be constructed of materials that will maintain their functional integrity during continuous handling, and in contact with the liquids and atmosphere, likely to be encountered in this application. The following items shall be accounted for in the precast unit design.

A. Precast Concrete Unit Design
   1. Design standard precast concrete units to withstand design load conditions in accordance with ACI 350. Design must also consider stresses induced during handling, shipping, and installation in order to avoid product cracking or other handling damage. Design loads for precast concrete units shall be indicated on the shop drawings, and designed by a licensed professional engineer.
   2. The structural design shall take into account discontinuities in the structure produced by openings.
   3. The Precast structures shall be designed to support its own weight as well as the minimum superimposed loads tabulated below. All additional equipment shall be accounted for in the design of the elements.
      i. Precast structures
         1. Top Slab (for effluent splitter box; parshall flume vault is open top)
         2. Live Load &Impact Load – AASTO LRHFD HL-93
         3. Floor slab

4. Live load – 200 psf
5. Exterior walls
6. All exterior walls below finished grade shall be designed for an equivalent fluid pressure of 90 psf caused by saturated earth pressure. The top of the pressure diagram is assumed to originate at finished grade. In addition to the soil pressure, a Live Load Traffic Surcharge shall be applied according to the AASHTO Specification.

4. The structures shall be designed to prevent floatation without the benefit of skin friction and the weight of mechanical equipment when the ground water level is at finished ground surface. The factor of safety against uplift calculated as a ratio of the total resisting force (excluding skin friction and the weight of the equipment) to the total hydrostatic uplift force shall be at least 1.15. The net uplift force shall be transferred to the anti-buoyancy collar.

B. Joints and Sealants
1. Joints and sealants between adjacent units shall be of the type and configuration indicated on the shop drawings meeting specified design and performance requirements.

C. Concrete Mix Design
1. Concrete type
   i. For non-machine cast products, the concrete shall be self-consolidating concrete which produces minimal bugholes and does not segregate.
2. Concrete Proportions
   i. Selection of proportions for concrete shall be based on current self- consolidating concrete mix design techniques. At a minimum, ACI 211.1 shall be used.
   ii. Upon request the precast concrete producer shall submit a mix design for each strength and type of concrete that will be used. Submitted mix designs shall include the quantity, type, brand and applicable data sheets for all design constituents as well as documentation indicating conformance with applicable reference specifications.
3. Durability and Performance Requirements
   i. Concrete Compressive Strength
      1. Precast concrete units shall have a 28-day compressive strength of 5000 psi for SCC.
   ii. Water-Cementitious Ratio
      1. Concrete that will be exposed to freezing and thawing shall contain air and shall have a water-cementitious ratio of 0.45 or less. Concrete which will not be exposed to freezing, but which is required to be leak resistant, shall have a water-cementitious ratio of 0.48 or less. For corrosion protection, reinforced concrete exposed to deicer salts, brackish water or seawater shall have a water-cementitious ratio of 0.40 or less.
   iii. Air Content
      1. The air content of concrete that will be exposed to freezing conditions shall be within the limits given below

Nominal Maximum Aggregate size (in)	Air Content %	
	Severe Exposure	Moderate Exposure
3/8	6.0 to 9.0	4.5 to 7.5
1/2	5.5 to 8.5	4.0 to 7.0
3/4	4.5 to 7.5	3.5 to 6.5

1	4.5 to 7.5	3.0 to 6.0
1-1/2	4.5 to 7.0	3.0 to 6.0
* For specified compressive strengths greater than 5000 psi, air content may be reduced 1%		

1.6 QUALITY ASSURANCE

The precast concrete producer shall demonstrate adherence to the standards set forth in the plant Quality Control Manual. The precast concrete producer shall meet the requirements written in subparagraph 1.6.A.

A. Qualifications, Quality Control and Inspection
   1. The precast producer shall maintain a permanent quality control department.
   2. The precast concrete producer shall have a quality control program which is audited for compliance annually by persons outside that plant's employee structure.
   3. Upon request, the precast concrete producer shall supply a copy of their quality control manual.

B. Quality Control
   1. The precast concrete producer shall show that the following quality control tests are performed as required and in accordance with the ASTM International standards indicated
      i. Concrete Testing
         1. Slump: A slump test shall be performed at least once per day per mix design used. Slump tests shall be performed in accordance with ASTM C 1611 for self-consolidating concrete.
         2. Temperature: The temperature of fresh concrete shall be measured each time a slump, air content, or compressive strength tests are made. Temperature shall be measured in accordance with ASTM C 1064.
         3. Compressive Strength: At least four compressive strength specimens shall be made each day for each mix design unless otherwise specified. In accordance with ASTM C 31, C 39, C 192.
         4. Air Content: Tests for air content shall be performed if the mix design specifies air entrainment. The air content will be measured in accordance with ASTM C 231. The Air Content shall be measured once per day per mix design.
         5. Density (Unit Weight): Tests for Density (Unit Weight) shall be performed monthly for each mix design used at a minimum. Tests shall be in accordance with ASTM C 138
      ii. Aggregate Testing
         1. A full set of aggregate tests shall be performed on each aggregate at least annually by an independent testing agency or an in house test lab. These tests will include gradations (ASTM C136), Soundness (ASTM C 88), Organic Impurities (ASTM C 40), Sand Equivalent for fine aggregates only (ASTM D 2419)
         2. Potential reactivity shall be performed once per each aggregate source, and when aggregate sources change (ASTM C 1260 or C 1293)
         3. Monthly, at a minimum, gradations shall be performed per ASTM C 33
         4. Aggregate Moisture tests: Moisture tests on aggregates shall be performed in accordance with ASTM C 70 or ASTM C 566. Fine aggregate moisture content tests shall be performed at least once per day if there are no moisture meters,

otherwise it shall be performed once per month. Alternatively the speedy moisture test is acceptable (ASTM D 4944).

iii. Preplacement Check
    1. All products shall be inspected for accuracy prior to placing concrete. Checks shall include, but not be limited to, form condition and cleanliness, form dimensions, joints, release agent, blockouts, inserts and locations, lifting devices, reinforcing steel size, spacing, clearances and proper placement.
    2. Preplacement checks shall be documented and initialed by the inspector. A drawing with verifications of the above criteria can be used as documentation.

iv. Postplacement Check
    1. All products shall be inspected for accuracy after the concrete forms have been removed. Checks shall include, but not be limited to, dimensional checks, finishing, insert locations, squareness, honeycombing, cracking, marking, coatings, racking, hole size and location. Postplacement checks may require a corrective action report.
    2. Postplacement checks shall be documented and initialed by the inspector. A drawing with verifications of the above criteria can be used as documentation.

2. Copies of the test results and Inspections above shall be available upon request.

C. Outside Inspection
    1. The customer or customer's agent (specifier) may place an inspector in the plant when the units covered by this specification are being manufactured. The precast concrete producer shall give notice of 3 days prior to the time the precast concrete units will be available for plant inspection

D. All equipment and materials furnished in the pump station shall be new and free of defects. All equipment shall be the manufacturer's latest and proven design.

E. All electrical materials, devices, and equipment shall be UL listed wherever applicable.

F. All equipment and installations shall meet the National Electric Code.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Handling
    1. Precast concrete units shall be handled and transported in a manner to minimize damage. Lifting devices or holes shall be consistent with industry standards. Lifting shall be accomplished with methods or devices intended for this purpose as indicated on the shop drawings. Upon request, the precast concrete producer shall provide documentation on acceptable handling methods for the product.

B. Storage
    1. Precast concrete units shall be stored in a manner that will minimize potential damage.

C. Delivery
    1. Precast concrete units shall be delivered to the site in accordance with the delivery schedule. Upon delivery to the jobsite, all precast concrete units shall be inspected by the customer's agent for quality and final acceptance.

D. Final Acceptance
   1. Upon final acceptance, the customer's agent acknowledges and understands the appropriate methods for handling the accepted precast concrete unit(s). Upon acceptance by the customer or customer's agent, the precast concrete manufacturer is not responsible for replacing damaged product resulting from improper handling practices on the job site.

1.8 PLANT CONDITIONS

Any plant producing precast concrete units for this specification shall have a written, implemented, comprehensive safety and environmental program. Upon request, documentation shall be provided to show the safety program meets the following minimum requirements.

A. Safety Program Requirements
   The safety program shall include the following written and documented parts as a minimum
   1. Housekeeping
   2. Lock-Out Tag-Out
   3. Machine Guarding
   4. Risk Assessment
   5. Personal Protective Equipment
   6. Contractor and Visitor Safety
   7. Cranes and Lifting Equipment Safety
   8. Ergonomics and handling Safety
   9. Fall Protection

B. Health and Safety Management System Requirements
   The health and safety management system shall be used to manage the safety program and all measureable aspects.

C. Environmental Management System Requirements

   The Environmental Management System shall encompass the following:
   1. Air Pollution Control
   2. Water and Wastewater Management

D. Recordable rate
   1. The recordable rate shall be below the industry average. If the industry average is not readily available, assume a value of 6 recordable injuries per 200,000 hours worked as the industry average.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:
   1. Oldcastle Precast Inc.
   2. Approved Equal.

2.2 PRODUCTS

A. Precast Concrete Effluent Splitter Structure

1. The precast structure shall be monolithically cast, shall be rectangular and have nominal exterior dimensions of 15 feet by 17 feet. The precast base section will be supplied with an extended buoyancy collar to withstand upward buoyant forces with ground water at grade. Overall structure height shall be as shown on the Contract Drawings.
2. Exterior Walls shall be a minimum of 6 inches thick, buoyancy footing shall be a minimum of 8 inches thick, and the roof slab with hatch and openings for gates shall be a minimum of 12 inches thick.
3. The Precast Structures shall be comprised of product-standard: base, riser sections, optional vault riser shims as required, and station cover.
4. All wall penetrations shall be formed utilizing hole-formers or cored drilled holes for manhole boots, and galvanized threaded couplings with waterstops for electrical connection.
5. All cast wall openings for ductile iron, PVC or galvanized steel pipe shall incorporate adjustable rubber manhole boots for a watertight seal.
6. All Precast components shall be fabricated on steel forms with machined rings to form accurate bell and spigot joint surfaces to ensure watertight joints.
7. The Horizontal joints between precast sections shall be sealed with a vulcanized butyl rubber joint material conforming to AASHTO M-198. The joint material shall be "Conseal CS-102" as manufactured by Concrete Sealants, or approved equal.
8. All surfaces of the precast structures shall be smooth, even, and free from roughness, irregularities and other defects. The surfaces shall be suitable for receiving exterior treatments as specified elsewhere herein.

B. Precast Concrete Parshall Flume Vault
1. The precast structure shall be monolithically cast, shall be rectangular and have nominal exterior dimensions of 14 feet by 11 feet. The precast base section will be supplied with an extended buoyancy collar to withstand upward buoyant forces with ground water at grade. Overall structure height shall be as shown on the Contract Drawings.
2. Exterior Walls shall be a minimum of 6 inches thick, buoyancy footing shall be a minimum of 8 inches thick.
3. The Precast Structures shall be comprised of product-standard: base, riser sections, optional vault riser shims as required.
4. All wall penetrations shall be formed utilizing hole-formers or cored drilled holes for manhole boots, and galvanized threaded couplings with waterstops for electrical connection.
5. All cast wall openings for ductile iron, PVC or galvanized steel pipe shall incorporate adjustable rubber manhole boots for a watertight seal.
6. All Precast components shall be fabricated on steel forms with machined rings to form accurate bell and spigot joint surfaces to ensure watertight joints.
7. The Horizontal joints between precast sections shall be sealed with a vulcanized butyl rubber joint material conforming to AASHTO M-198. The joint material shall be "Conseal CS-102" as manufactured by Concrete Sealants, or approved equal.
8. All surfaces of the precast structures shall be smooth, even, and free from roughness, irregularities and other defects. The surfaces shall be suitable for receiving exterior treatments as specified elsewhere herein.

C. Effluent Splitter Structure Access Frame and Cover

1. Furnish and install (1) aluminum access hatch (84" x 84") nominal interior dimension, flush with precast cover, 300psf, H20 AASHTO load rating with 316-stainless steel hardware. Cover will be minimum ¼" diamond plate with stainless steel slam lock and weather plug, lift handle which sits flush with cover, recessed pad lock clip (pad lock by others), hold open arm

to lock cover in 90-degree position, heavy duty stainless hinges. Frame to be angle style with continuous 1 ½" anchor flange and full slab- height skirt to show no exposed concrete when hatch is open, exterior surfaces in contact with concrete to receive one coat bituminous paint.

2. Access hatch to be supplied with integral safety grating system. The safety grate shall be made of 6061-T6 aluminum and designed per the "Specifications for Aluminum Structures". The grating shall be designed to withstand 300psf, H20 AASHTO loading. Each grate shall be supplied with a heavy duty, stainless steel pneu-spring for ease of operation when opening. Each grate shall be provided with a permanent hinging system; which will lock the grate in the 90-degree position once opened. Grate shall be coated with an OSHA type safety orange color, base coat is a thermosetting epoxy powder coat finish with a minimum thickness of 2-4 mils. The top coat is a mar-resistant, TGIC polyester powder coating with a minimum thickness of 2-4 mils. Each coat shall be baked at 350-375 degrees F until cured.
3. Access hatches to be manufactured by EJ, East Jordan, MI, or approved equal.

D. Wall Penetrations (for both effluent splitter structure and parshall flume vault)
   1. Where wall penetrations are called for on the plans; mechanical piping shall utilize cast or cored openings with flexible manhole boots. Flexible rubber boots shall consist of EPDM polymer compounds meeting ASTM C923 material performance requirements. Expansion banding and strap shall be 304-stainless material and the connection between boot and structure shall utilize an expansion wedge system with 304-stainless wedge and hardware components.
   2. Electrical conduit penetrations will utilize galvanized electrical couplings assemblies with 2" wide minimum waterstop embedded in the structure at casting, or cored openings with mechanical rubber seals to fill the annular spacing between electrical conduit and precast wall structure. Mechanical seals shall be Link Seal by Thunderline Corp. or approved equal and shall utilize 304-stainless assembly hardware. Mechanical seals shall be employed when pump control panel or exterior junction box option is factory mounted to the station.

2.3 MATERIALS

Except as otherwise specified, material shall conform to the following section.

A. Materials

Cement	ASTM C 150 (Type I, II, III, or V) ASTM C 595 (for Blended Cements
Silica Fume	ASTM C 1240
Fly Ash and Pozzolans	ASTM C 618
Ground Granulated Blast-Furnace Slag	ASTM C 989
Water	ASTM C 1602 (the use of reclaimed/recycled water shall be permitted)
Aggregates	ASTM C 33 (and aggregate specifications)
Air Entraining Admixtures	ASTM C 260

Accelerating, Retarding, Water Reducing Admixtures	ASTM C 494
Corrosion Inhibitors	ASTM C 1582
Reinforcing Bars	ASTM A 615 or ASTM A 706
Plain, Welded Wire Reinforcement	ASTM A 185
Deformed, Welded Wire Reinforcement	ASTM A 497
Epoxy Coated Reinforcing Bars	ASTM A 775
Epoxy Coated Welded Wire Reinforcement	ASTM A 884
Hot-Dipped Galvanizing for Inserts	ASTM A 152
Rubber Gaskets for Circular Pipe	ASTM C 443
External Sealing Bands for Pipe	ASTM C 877
Preformed Flexible Joint Sealants for Concrete Pipe, Manholes, and Manufactured Box Sections	ASTM C 990
Elastomeric Joint Sealants	ASTM C 920
Pipe Entry Connectors	ASTM C 923, ASTM C 1478
Nonshrink Grout	ASTM C 1107

2.4 MANUFACTURE

Manufacture shall conform to the producer's acceptable quality control manual

A. Forms
   1. Forms for manufacturing precast concrete units shall be of the type and design consistent with industry standards and practices. They should be capable of consistently providing uniform products and dimensions. Forms shall be constructed so that the forces and vibrations to which the forms will be subjected cause no damage to the precast concrete unit.
   2. Forms shall be cleaned of concrete build-up after each use.
   3. Form release agents shall be applied according to the manufacturer's recommendations and shall not be allowed to build up on the form casting surface.

B. Reinforcement
   1. Cages of reinforcement shall be fabricated by tying the bars, wires or welded wire reinforcement. The tolerances for concrete cover shall be 3/8 in. or as specified in the design. Welding shall be allowed only for ASTM A 706 rebar.
   2. Positive means shall be taken to assure that the reinforcement does not move significantly during the casting operations

C. Embedded Items

1. Embedded items shall be positioned at locations specified in the design documents. Inserts and other embeds shall be held rigidly in place so that they do not move significantly during casting operations.

D. Concrete
   1. Concrete Mixing
      i. Mixing operations shall produce batch-to-batch uniformity of strength, consistency and appearance
      ii. Batching weight and volume measurement devices shall be annually calibrated by an independent testing laboratory or more frequently if batching irregularities or concrete inconsistencies are observed
   2. Concrete placing
      i. Concrete shall be placed in a manner in which it flows and consolidates without segregation or air entrapment. The freefall of concrete shall be kept to a minimum.
      ii. Cold Weather Concreting
         1. Recommendations for cold weather concreting are given in detail in ACI 306 R. Adequate equipment shall be provided for heating concrete materials and protecting concrete during freezing or near- freezing temperatures. All concrete materials, reinforcement, and forms shall be free from frost. In cold weather, the temperature of the concrete at the time of placement shall not be below 45 degrees F. Concrete that freezes before it reaches a compressive strength of 500 psi shall be discarded.
      iii. Hot Weather Concreting
         1. Recommendations for hot weather concreting are given in detail in ACI 305 R. During hot weather excessive concrete temperatures and water evaporation shall be minimized. The temperature of concrete at the time of placing shall not exceed 95 degrees F.
   3. Concrete Curing
      i. Curing operations shall commence immediately following the initial set of the concrete and completion of surface finishing.
      ii. Curing by moisture retention
         1. Precast products shall be protected from drafts and wind to prevent plastic shrinkage cracking.
         2. Moisture shall be prevented from excessively evaporating from exposed surfaces until adequate strength for stripping the precast concrete unit from the form is reached.
      iii. Curing with Heat and Moisture
         1. Concrete shall not be subjected to steam or hot air until after the concrete has attained its initial set. If hot air is used, precautions shall be taken to prevent moisture loss from the concrete. The temperature of the concrete shall not be permitted to exceed 150 degrees F. The temperature gain shall not exceed 40 degrees F per hour.
   4. Surface Finish
      i. The surface finish shall be as specified on the contract documents and/or approved shop drawings.

1. Stripping Precast Concrete Units from Forms

Precast concrete units shall not be removed from the forms until the concrete reaches the compressive strength for stripping required by design. Stripping strengths shall be routinely measured to ensure product has attained sufficient strength for safe handling.

2. Patching and Repair

   i. Repairing Minor Defects
      1. Defects that will not impair the functional use or expected life of the precast concrete unit may be repaired by any method that does not impair the product

   ii. Repair Honeycombed Areas

      1. When honeycombed areas are to be repaired, all loose material shall be removed and the areas cut back into essentially horizontal or vertical planes to a depth at which coarse aggregate particles break under chipping rather than being dislodged. Proprietary repair materials shall be used in accordance with the manufacturer's instructions. Otherwise, the area shall be saturated with water. Immediately prior to repair, the area should be damp, but free of excess water. A cement-sand grout or an approved bonding agent shall be applied to the chipped surfaces, followed immediately by consolidating an appropriate repair material into the cavity.

   iii. Repairing Major Defects
      1. Defects in precast concrete products which impair the functional use or the expected life of products shall be evaluated by qualified personnel to determine if repairs are feasible and, if so, to establish the repair procedure.

3. Shipping Precast Concrete Units
   i. Precast concrete units shall not be shipped until they have reached at least 70% of their specified 28-day design strength, unless damage will not result, impairing the performance of the product.

2.5 WARRANTY

A. The manufacturer of the precaste concrete unit shall guarantee for one (1) year from the date of installation that the structure will be free from defects in design, material and workmanship.

B. Warranties and guarantees by the suppliers of various components in lieu of a single source responsibility by the manufacturer will not be accepted. The manufacturer shall be solely responsible for the warranty of the station and all components.

C. In the event a component fails to perform as specified or is proved defective in service during the warranty period, the manufacturer shall provide a replacement part without cost to the Owner. The Contractor shall further provide, without cost to the Owner such labor as may be required to replace, repair or modify major components such as the station structure, pumps, pump motors sewage piping manifold, etc.

PART 3 - EXECUTION

3.1 SURVEY

A. The installation area shall be surveyed using the work print and a checklist to identify the work to be done and to determine that the plans are correct.

B. All underground facilities and structures such as gas, water, sewer, power, telephone cable, and so forth shall be located and identified. Location markings shall be placed by the affected utilities before construction.

C. The survey shall identify and obstacles such as overhead wires, building structures that will interfere with crane operations, work progress, or create a safety hazard.

D. The survey shall give consideration to the soil structure so that proper shoring, sloping, or both may be planned in advance of the excavation work

3.2 PLANNING

A. Permits required to do work in accordance with the detail plans shall be secured before starting the job. All permits or a record of the permits shall be retained on the job for immediate reference.

B. All utilities and owners of surface and subsurface facilities and structures in the area shall be given advance notification of proposed excavation. Every effort shall be made to avoid damage to the facilities of others. If any damage occurs, the owner of the damaged facility shall be notified immediately.

C. Planning shall include the coordination of all responsible parties to ensure that arrangements for removal of excess and damaged material have been made.

D. Should it appear that a structure location will interfere with traffic, review the situation with the engineer and notify appropriate authorities.

E. Provide for access to call boxes, fire hydrants, etc.

3.3 SAFETY REQUIREMENTS

A. Safety requirements for construction shall be in accordance with all federal, state, and local regulations.

3.4 EXCAVATING

A. If unforeseen facilities or obstructions are encountered, stop excavation operations immediately. Expose the obstruction via hand dig operations and investigate them with caution. If there is any doubt as to the type of obstruction exposed, request positive identification from those suspected of owning the facility and then proceed as circumstances dictate.

B. Inspect excavations after every rainstorm or other hazard-increasing occurrence, and increase the protection against slides and cave-ins, if necessary

C. In dewatering excavations, make certain that the discharge is carried to a suitable runoff point. Also verify that the design accounts for the level of groundwater encountered.

D. Excavation size shall be large enough to allow access around the structure after it is installed.

E. All excavating shall be under the full guidelines for on-site OSHA regulations, and shall be under the supervision of an OSHA-certified competent person.

3.5 SHORING

A. Shoring for construction shall be in accordance with all federal, state, and local regulations

3.6 INSTALLATION

A. General

Installation of the pump chamber sections and related equipment shall be done in accordance with written instructions supplied by the manufacturer. Installation oversight service (1-day) can be provided by the pump station manufacture (as may be required by the owner), when specifically stated as necessary site service. Additional days for factory technicians shall be paid for at the standard daily rate.

B. Assembly
   1. The precast concrete unit shall be factory assembled and shipped to the job site as follows:
      i. Wet well precast base assembly with interior fillet and extended base.
      ii. Precast concrete riser shims as required, shall include holes and factory installed rubber boots as required.
      iii. Precast pump station top slab shall include aluminum access covers (300# or HS20 loading as required).

C. Site Access

The general contractor shall be responsible for providing adequate access to the site to facilitate hauling, storage, and proper handling of the precast concrete units.

D. Subgrade Bedding Materials and compaction

The installation contractor shall be responsible for ensuring that the subgrade is compacted to 95% of ASTM D558 density. The subgrade shall be a minimum of 6” in depth. A granular material shall be used to create a level surface for placing the precast concrete unit.

E. Installation

Precast concrete units shall be installed: to the lines and grades shown on the contract documents or otherwise specified; be lifted by suitable lifting devices at points provided by the precast concrete producer; in accordance with applicable industry standards. Upon request, the precast concrete producer shall provide installation instructions

Field modifications to the product shall relieve the precast producer of liability and warranty regardless if such modifications result in the failure of the precast concrete unit.

F. Leak Resistance

Where leak resistance is a necessary performance characteristic of the precast concrete unit's end use, joint sealant, pipe-entry connectors and other penetrations shall be sealed according to manufacturers requirements to ensure the integrity of the system.

3.7 BACKFILLING AND RESTORATION

A. Do the backfilling as soon as possible after the structure has been placed.

B. Backfill material shall be granular and free from large stones, rocks, and pavement. Expansive soil material shall not be used as backfill around the structure.

C. Backfilling shall be achieved by lifts (layers) to the required compaction.

D. Follow up inspections for settlements are required. Should settlement occur, the contractor shall be responsible for all necessary repairs.

3.8 FIELD QUALITY CONTROL

A. Inspection
   1. Final field elevations and compaction properties shall be verified and documented.

+ + END OF SECTION + +

SECTION 03600

GROUT

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified and required to furnish and install grout.
   2. Grout shall be placed at the following locations:
      a. Equipment bases.
      b. Handrails and railings.
      c. Construction joints.
      d. Intrusion grouting.
   3. The types of grout include the following:
      a. Non-shrink, epoxy type.
      b. Non-shrink, non-metallic type.
      c. Ordinary cement-sand.

B. Classes of Ordinary Cement Type Grout:
   1 Class "A" ordinary cement type gout shall have a compression strength of 4000 psi and include the following:
      a. Foundation grout.
      b. Construction joint grout.
   2. Class "B" ordinary cement type grout shall have a compression strength of 3000 psi and include the following:
      a. Bonded topping grout for concrete tank.
      b. Masonry linters, bond beams, and pilasters grout fill.
      c. Related Sections:
         1) Section 0325 1, Concrete Joints.
         2) Section 03300, Cast-In-Place Concrete.
         3) Section 04100, Mortar.
         4) Section 05120, Structural Steel.

1.2 QUALITY ASSURANCE

A. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
   1. ASTM C 144, Standard Specification for Aggregate for Masonry Mortar.
   2. ASTM C 150, Standard Specification for Portland Cement.
   3. ASTM C 109, Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (using 2-in. or 50 mm. Cube Specimens).
   4. CRD-C-619, Specification for Grout Fluidifier.
   5. CRD-C-621, Specification for Non-Shrink Grout.
   6. ASTM C 191, Time of Setting of Hydraulic Cement by Vicat Needle.

1.3 SUBMITTAL

A. Shop Drawings: Submit for approval the following:
   1. Manufacturer's specifications and installation instructions for all proprietary materials.
   2. For ordinary cement grout, copies of grout design mix and laboratory test reports for grout strength tests.

B. Reports and Certificates:
   1. For proprietary materials, submit copies of reports on quality control tests.
   2. Submit certification that materials meet specification requirements for nonproprietary materials.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery of Materials: Grout materials from manufacturers shall be delivered in unopened containers and shall bear intact manufacturer's labels.

B. Storage of Materials: Grout materials shall be stored in a dry shelter and shall be protected from moisture.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Nonmetallic, 100 percent solids, high strength epoxy grout.
   1. Use prepackaged, solvent-free, moisture insensitive, high strength epoxy grout.
   2. Product and Manufacturer: Provide one of the following:
      a. Euco High Strength Grout, as manufactured by The Euclid Chemical Company.
      b. Sikadur 42 Grout Pak, as manufactured by Sika Corporation.
      c. Five Star Epoxy Grout by Five Star Products, Incorporated.
      d. Or equal.

B. Nonshrink, Nonmetallic Grout:
   1. Prepackaged non-staining cementious grout which shall meet the minimum requirements of CRD C-621 and requiring only the addition of water at the jobsite.
   2. Product and Manufacturer: Provide one of the following:
      a. Euco N-S, as manufactured by The Euclid Chemical Company.
      b. Masterflow 928, as manufactured by Master Builders, Incorporated.
      c. Sika Grout 212, as manufactured by Sika Corporation.
      d. Or equal.

C. Ordinary Cement-Sand Grout: Prepare design mixes of ordinary cement grout. Mixes subject to the following limitations:
   1. Cement:
      a. Portland cement, ASTM C150, Type 11; or blended hydraulic cement, ASTM C595, Type IP.
   2. Aggregates: ASTM C33 and as herein specified.
      a. Do not use aggregates containing soluble salts or other substances such as iron sulfides, pyrite, marcasite, ochre, or other materials that can cause stains on exposed concrete surfaces.

b. Fine Aggregate: Clean, sharp, natural sand free from loam, clay, lumps or other deleterious substances.
   1) Dune sand, bank run sand and manufactured sand are not acceptable.
c. Coarse Aggregate: Clean, uncoated, processed aggregate containing no clay, mud, loam, or foreign matter, as follows:
   1) Crushed stone, processed from natural rock or stone.
   2) Washed gravel, either natural or crushed. Use of slag and pit or bank run gravel is not permitted.
   3) Coarse Aggregate Size: Size to be ASTM C33, No. 7 for Class "B" grout. Coarse aggregate not permitted in Class "A" grout.

3. Admixtures: Provide admixtures produced by established reputable manufacturers and use in compliance with the manufacturer's printed instruction. Do not use admixtures that have not been incorporated and tested in the accepted mixes, unless otherwise authorized in writing by OWNER. Refer to Section 03300, Cast-In-Place Concrete, for additional admixture requirements.
4. Proportioning and Design of Mixes: Prepare design mixes for each class of grout. Mixes subject to the following limitations:
   a. Class "A" Grout:
      1) Specified 28-day Compressive Strength: 4,000 psi.
      2) Maximum Water-Cement Ratio by Weight: 0.45.
      3) Fine Aggregate, meeting ASTM C33.
      4) Air Content Percentage: 6± percent.
      5) Minimum Cement Content in Pounds per Cubic Yard: 658.
   b. Class "B" Grout:
      1) Specified 28-day Compressive Strength: 3,000 psi.
      2) Maximum Water-Cement Ratio by Weight: 0.50.
      3) Fine and Coarse Aggregate (No. 7) meeting ASTM C33.
      4) Air Content Percentage: 7± percent.
5. Minimum Cement Content in Pounds per Cubic Yard: 61 1.
   a. Use an independent testing company acceptable to OWNER for preparing and reporting proposed mix designs.
   b. The testing company shall not be the same as used for field quality control testing unless approved by OWNER.
6. Proportion mixes by either laboratory trial batch or field experience methods, using materials to be employed on the Project for grout required. Comply with ACI 21 1.1 and report to OWNER the following data:
   a. Complete identification of aggregate source of supply.
   b. Tests of aggregates for compliance with specified requirements.
   c. Scale weight of each aggregate.
   d. Absorbed water in each aggregate.
   e. Brand, type and composition of cement.
   f. Brand, type and amount of each admixture.
   g. Amounts of water used in trial mixes.
   h. Proportions of each material per cubic yard.
   i. Gross weight and yield per cubic yard of trial mixtures.
   j . Measured slump.
   k. Measured air content.
   1. Compressive strength developed at seven (7) days and 28 days, from not less than 3 test specimens cast for each seven (7) day and 28-day test, and for each design mix.
7. Submit written reports to OWNER of proposed mix of grout at least 30 days prior to start of Work. Do not begin grout production until mixes have been approved by OWNER.

8. Laboratory Trial Batches: When laboratory trial batches are used to select grout proportions, prepare test specimens and conduct strength tests as specified in ACI 301, Chapter 3 - Proportioning. However, 4,000 psi mixes need not be designed for greater than 4,600 psi, and 3,000 psi mixes need not be designed for greater than 3,400 psi, regardless of the production facilities standard deviation.
9. Field Experience Method: When field experience methods are used to select grout proportions, establish proportions as specified in ACI 301, Chapter 4.
10. Admixtures: Use air-entraining admixture in all grout. Provide not less than 4-1/2 percent nor more than 7-1/2 percent entrained air. Use amounts of admixtures as recommended by the manufacturer for climatic conditions prevailing at the time of placing. Adjust quantities and types of admixtures as required to maintain quality control. Do not use admixtures which have not been incorporated and tested in the accepted design mix, unless otherwise authorized in writing by OWNER.
11. Slump Limits: Proportion and design mixes to result in grout slump at the point of placement of not more than 5-inches.

D. Water:
1. Use clean, fresh, potable water free from injurious amounts of oils, acids, alkalies or organic matter.

PART 3 - EXECUTION

3.1 INSPECTION

A. CONTRACTOR and his installer shall examine the substrate and conditions under which grout is to be placed and notify OWNER, in writing, of unsatisfactory conditions. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to OWNER.

3.2 INSTALLATION

A. General:
1. Place grout as shown and in accordance with manufacturer's instructions. If manufacturer's instructions conflict with the Specifications, do not proceed until OWNER provides clarification.
2. Drypacking will not be permitted.
3. Manufacturers of proprietary products shall make available upon 72 hours notification the services of a qualified, full time employee to aid in assuring proper use of the product under job conditions. The cost of this service, if any, shall be borne by CONTRACTOR.
4. Placing grout shall conform to temperature and weather limitations in Section 03300, Cast-In-Place Concrete.

B. Equipment Bases:
1. After shimming equipment to proper grade, securely tighten anchor bolts. Properly form around the base plates, allowing sufficient room around the edges for placing the grout. Adequate depth between the bottom of the base plate and the top of concrete base must be provided to assure that the void is completely filled with the epoxy grout.
2. After shimming columns, beams and equipment to proper grade, securely tighten anchor bolts. Properly form around the base plates allowing sufficient room around the edges for placing the grout. Adequate depth between the bottom of the base plate and the top of

concrete base must be provided to assure that the void is completely filled with the non-shrink, non-metallic grout.

C. Handrails and Railings:
   1. After posts have been properly inserted into the holes or sleeves, fill the annular space between posts and sleeve with the non-shrink, non-metallic grout. Bevel grout at juncture with post so that moisture flows away from post.

+ + END OF SECTION + +

SECTION 05051

ANCHOR BOLTS, ADHESIVE ANCHORS AND CONCRETE INSERTS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified, and required to furnish and install anchor bolts, adhesive anchors and concrete inserts.

B. This Section includes all bolts, anchors and inserts required for the Work, but not specified under other Sections.

C. The types of Work using the bolts, anchors and inserts include, but are not limited to the following:
   1. Effluent splitter box gates
   2. Parshall flume vault grating system and access ladder

1.2 QUALITY ASSURANCE

A. Reference Standards: Comply with the applicable provisions and recommendations of the following, except as otherwise shown and specified.
   1. ASTM A36/ A 36M, Standard Specification for Structural Steel.
   2. ASTM A 123/ A 123M, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
   3. ASTM A 153/ A 153M, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
   4. ASTM A 307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile.
   5. ASTM A 320/ A 320M, Standard Specification for Alloys-Steel Bolting Materials for Low-Temperature Service.
   6. ASTM A 484/ A 484M, Standard Specification for General Requirements for Stainless and Heat-Resisting Steel Bars, Billets and Forgings.
   7. ASTM A 653/ A 653M, Standard Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   8. International Code Council Evaluations Service (ICC-ES)

1.3 SUBMITTALS

A. Shop Drawings: Submit for approval the following:
   1. Setting drawings and templates for location and installation of anchorage devices.
   2. Copies of manufacturer's specifications, load tables, dimension diagrams and installation instructions for the devices.

B. Samples: Submit for approval the following:

1. Representative samples of bolts, anchors and inserts as may be requested by OWNER. Review will be for type and finish only. Compliance with all other requirements is exclusive responsibility of CONTRACTOR.

PART 2 - PRODUCTS

2.1 DESIGN CRITERIA

A. When the size, length or load carrying capacity of an anchor bolt, adhesive anchor, or concrete insert is not shown, provide the size, length and capacity required to carry the design load times a minimum safety factor of 4.

B. Determine design loads as follows:
   1. For equipment anchors, use the design load recommended by the manufacturer and approved by OWNER.
   2. For pipe hangers and supports, use one half the total weight of pipe, fittings, valves, accessories and water contained in pipe, between the hanger or support in question and adjacent hangers and supports on both sides.
   3. Allowances for vibration are included in the safety factor specified above.
   4. Anchors shall develop ultimate shear and pull-out loads of not less than the following values in cracked concrete:

Bolt Diameter (Inches)	Min. Shear (Pounds)	Min. Pull-Out Load (Pounds)
1/2	8,300	6,500
5/8	12,500	9,000
3/4	17,400	12,200

2.2 MATERIALS

A. Anchor Bolts:
   1. Provide carbon steel bolts complying with ASTM A 1554 Grade 36, headed type, unless otherwise indicated.
   2. In buried or submerged locations, or areas where washdown and moisture will be a concern, provide AISI Type 316 stainless steel bolts complete with nuts and washers complying with ASTM A 320/ A 320M. Other AISI types may be used, subject to OWNER'S approval.
   3. For equipment, provided anchor bolts which meet the equipment manufacturer's recommendations for size, material, and strength.
   4. Provide anchor bolts as shown or as required to secure structural steel to concrete or masonry.
   5. Locate and accurately set the anchor bolts using templates or other devices as necessary.
   6. Protect thread and shank from damage during installation of equipment and structural steel.
   7. Comply with required embedment length and necessary anchor bolt projection.

B. Adhesive Anchors:
   1. Provide AISI Type 316 stainless steel anchors complying with ASTM A 320/ A 320M.
   2. Anchors shall be of the size required for the concrete strength specified.
   3. Anchors shall utilize epoxy resin or vinylester resin.

a. Provide system utilizing a screen tube with a cartridge dispenser which contains two parallel tubes of resin and hardener. The installed system shall achieve minimum strength requirements recommended by the manufacturer.

4. Product and Manufacturer: Provide anchors by one of the following:
   a. HIT HY-150 MAX Adhesive Anchors, as manufactured by Hilti, Inc.
   b. Epcon System, as manufactured by ITW Ramset/Red Head.
   c. Or approved equal.

C. Concrete Inserts:
   1. For piping, grating, floor plate and masonry lintels, provide malleable iron inserts. Comply with Federal Specification WW-H-171E (Type 18). Provide those recommended by the manufacturer for the required loading.
   2. Finish shall be black.
   3. Product and Manufacturer: Provide inserts of one of the following:
      a. Figure 282, as manufactured by Anvil International Inc.
      b. No. 380, as manufactured by Hohmann and Barnard, Incorporated.
      c. Or equal.

D. Expansion Anchors, powder actuated fasteners and other types of bolts and fasteners not specified herein shall not be used, unless approved by OWNER.

PART 3 - EXECUTION

3.1 INSPECTION

A. CONTRACTOR shall examine areas and conditions under which anchor bolts, adhesive anchors, and concrete insert Work is to be installed, and notify OWNER, in writing, of conditions detrimental to proper and timely completion of Work. Do not proceed with Work until unsatisfactory conditions have been corrected in a manner acceptable to OWNER.

3.2 INSTALLATION

A. Drilling equipment used and installation of expansion anchors shall be in accordance with manufacturer's instructions.

B. Assure that embedded items are protected from damage and are not filled in with concrete.

C. Use concrete inserts for pipe hangers and supports for the pipe size and loading recommended by the insert manufacturer.

D. For the adhesive anchors and adhesive material, CONTRACTOR shall comply with the manufacturer's installation instructions on the hole diameter and depth required to fully develop the tensile strength of the anchor or reinforcing bar. CONTRACTOR shall properly clean out the hole utilizing a wire brush and compressed air to remove all loose material form the hole, prior to installing adhesive capsules or material.

E. Adhesive anchor manufacturer's representative shall observe and demonstrate the proper installation procedures for the adhesive anchors and adhesive material at no additional expense to the OWNER. Each installer shall be certified, in writing, by the manufacturer to be qualified to install the adhesive anchors.

3.3 CLEANING

A. After embedding concrete is placed, remove protection and clean bolts and inserts.

3.4 FIELD QUALITY CONTROL

A. CONTRACTOR shall employ a testing laboratory to perform field quality testing of installed anchors. OWNER is to determine the level of testing which is required for the various types of adhesive anchors and bolts. A minimum of 10 percent of the adhesive anchors and reinforcing bars are to be tested to 50 percent of the ultimate tensile capacity of the anchor or reinforcing bar.

B. If failure of any of the adhesive anchors or reinforcing bars occurs, CONTRACTOR will be required to pay for the costs involved in testing the remaining 90 percent.

C. CONTRACTOR shall correct improper workmanship, remove and replace, or correct as instructed by the OWNER, all anchors or bars found unacceptable or deficient, at no additional cost to the OWNER.

D. CONTRACTOR shall pay for all corrections and subsequent tests required to confirm the integrity of the anchor or bar.

E. The independent testing and inspection agency shall complete a report on each area. The report should summarize the observation made by the inspector and be submitted to OWNER.

F. Provide access for the testing agency to places where Work is being produced so that required inspection and testing can be accomplished.

+ + END OF SECTION + +

SECTION 05532

ALUMINUM GRATING AND CHECKER PLATE

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install aluminum grating, frames and checker plate.
   2. The types of grating required shall be the following:
      a. Pressure locked.
         1) Rectangular section.
         2) I-bar section.
   3. The Work also includes:
      a. Providing openings in grating to accommodate the Work under this and other Sections and attaching to the grating all items such as sleeves, bands, studs, fasteners and all items required for which provision is not specifically included under other Sections.

B. Coordination:
   1. Review installation procedures under other Sections and coordinate the Work that must be installed with or attached to the grating.

C. Related Sections:
   1. Section 03300, Cast-In-Place Concrete.
   2. Section 05501, Miscellaneous Metal Fabrications.

1.2 QUALITY ASSURANCE

A. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
   1. ASTM B 209, Aluminum Alloy Sheet and Plate.
   2. ASTM B 210, Standard Specification for Aluminum and Aluminum- Alloy Drawn Seamless Tubes.
   3. ASTM B 221, Standard Specification for Aluminum and Aluminum- Alloy Extruded Bars, Rods, Wire, Shapes and Tubes.
   4. NAAMM, Metal Finishes Manual, and Metal Bar Grating Manual.
   5. Aluminum Association Standards.

B. Field Measurements: Take field measurements prior to preparation of Shop Drawings and fabrication where required, to ensure proper fitting of the Work.

1.3 SUBMITTALS

A. Samples: Submit for approval the following: Representative samples of grating, appurtenances and other finished products requested by OWNER. His review will be for type and finish only. Compliance with all other requirements is the exclusive responsibility of CONTRACTOR.

B. Shop Drawings: Submit for approval the following:

1. Fabrication and erection of all Work. Include plans, elevations, and details of sections and connections. Show anchorage and accessory items.
2. Setting drawings and templates for location and installation of anchorage devices.
3. Manufacturer's specifications, load tables, dimension diagrams, anchor details and installation instructions.

PART 2 - PRODUCTS

2.1 PERFORMANCE CRITERIA

A. The manufacturer shall furnish grating to conform the following criteria:
   1. Design Loads: Uniform live load or a concentrated load on any area 24-inches square, whichever gives the greatest stresses, unless otherwise shown on the Drawings.

a. Live Load	Concentrated Load
300 psi	3000 lbs

   2. Maximum Clear Span Deflection: 1/120 of span or 1/4-inch, whichever is smaller.
   3. Maximum Fiber Stress: 12,000 psi.
   4. Bearing bars shall be a maximum of 1-3/16-inches on center and 3/16-inches minimum thickness.
   5. Cross bars or bent connecting bars shall not exceed 7-inches on center.

B. The manufacturer shall furnish removable checkered plate or plank grating to conform to the following, unless otherwise shown on the Drawings:
   1. Aluminum Checkered Plate:
      a. Minimum thickness: 1/2-inch.
      b. Design Uniform Load: 200 psi, unless otherwise shown on the Drawings.
      c. Maximum clear span deflection: 1/120th of the span or 1/4-inch, whichever is the smaller.
   2. Aluminum Plank Grating:
      a. Minimum depth: 1-1/2-inch.
      b. Design Uniform Load: 200 psi, unless otherwise shown on the Drawings.
      c. Maximum clear span deflection: 1/120th of the span or 1/4-inch, whichever is the smallest.
      d. Plank grating to be banded on all external edges.

2.2 MATERIALS

A. Bearing Bars: Alloy 6061-T6 or Alloy 6063-T6, conforming to ASTM B 221.

B. Cross Bars or Bent Connecting Bars: Alloy conforming to either ASTM B 221 or ASTM B 210.

C. Aluminum Checkered Plate:
   1. Provide aluminum checkered plate as shown and specified. Plate to conform to ASTM B 209. Provide anodized finish.
   2. Raised Pattern Floor Plate: Provide pattern standard with the manufacturer. Alloy and temper to be Alloy 606 1 -T6.

D. Aluminum Plank Grating:
   1. Provide aluminum plank grating as shown and specified (aluminum plank grating is an alternate to 1/2-inch checkered plate.)

2. Top surface shall be plain unpunished and have continuous raised longitudinal ridges for skid resistance.
3. Material shall be provided with anodized finish. Alloy and temper to be Alloy 606 1-T6.
4. Product and Manufacturer: Provide one of the following:
   a. IKG Borden, Type H.D. Unpunched.
   b. Klemp, Duo-grip, Unpunched.
   c. Or equal.

2.3 FABRICATION

A. Use materials of the minimum size and thickness as specified above unless shown otherwise. Work to the dimensions shown on approved Shop Drawings.

B. Grating shall be as shown and shall comply with the NAAMM "Metal Bar Grating Manual", except as specified herein.
   1. Cross Bars: Manufacturer's standards to suit project requirements.
   2. Traffic Surface: Knurled.

C. Type of Finish: Clear anodized with a minimum coating of 0.0008-inch in accordance with Aluminum Association Standard A41.

D. Provide grating sections with end-banding bars welded about 4-inches on centers for each panel, four (4) saddle clip or flange block anchors designed to fit two (2) bearing bars, and four (4) stud or machine bolts with washers and nuts, unless otherwise indicated.

E. Cut gratings for penetrations as indicated. Layout units to allow grating removal without disturbing items penetrating grating.
   1. For openings in grating separated by more than four (4) bearing bars, provide banding of same material and size as bearing bars, unless otherwise indicated. Weld band to each bearing bar.
   2. Notching of bearing bars at supports to maintain elevations will not be permitted.

F. Weld stainless steel stud bolts to receive saddle clip or flange block anchors to supporting steel members. Drill for machine bolts when supports are aluminum.

G. Provide gratings in concrete with aluminum angle frames having mitered comers and welded joints. Grind exposed joints smooth. Frames shall have welded anchors set into concrete. Angle size shall match grating depth selected to assure flush fit.

H. Provide gratings attached to existing concrete, masonry or steel with aluminum bearing angles fastened with anchors as shown or otherwise approved by OWNER.

I. Gratings in concrete floors shall be removable **or** hinged and shall be arranged in sizes to be readily lifted. Provide gratings in concrete with aluminum angle frames having mitered comers and welded joints. Grind exposed joints smooth. Frames shall have welded anchors set into concrete. Angle size shall match grating depth selected to assure flush fit.

2.4 CHECKERED PLATES AND ALUMINUM PLANK GRATING

A. Provide removable checkered plates and aluminum plank grating in the locations and sizes shown on the Drawings. Also, provide perforated plates where shown.

B. Each checkered plate or plank section shall be provided with four (4) lifting handles as recommended by the manufacturer. The lifting handles shall be of the recessed, drop handle type. Maximum weight of checkered plate or plank section shall be 150 pounds.

C. Checkered plates shall have a checkered, nonslip surface.

D. The aluminum plates and planks shall have an anodized finish. Protect finish with a factory-applied coating of lacquer standard with the manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Fastening- to In-Place Construction:
   1. Use anchorage devices and fasteners to secure grating to supporting members or prepared openings, as recommended by the manufacturer.

B. Cutting, Fitting and Placement:
   1. Perform all cutting, drilling and fitting required for installation. Set the Work accurately in location, alignment and elevation, plumb, level, true and free of rack. Do not use wedges or shimming devices.
   2. Wherever gratings are pierced by pipes, ducts, and structural members, cut openings neatly and accurately to size and attach a strap collar not less than 1/8-inch thick to the cut ends of the bars.
   3. Divide the panels into sections only to the extent required for installation wherever grating is to be placed around previously installed pipe, ducts, and structural members.
   4. For contact surfaces between aluminum and concrete, masonry, steel, or other dissimilar surface use a coat of bituminous paint or other approved insulating material.

C. Protection of Aluminum from Dissimilar Materials: Using approved asphaltic or zinc chromate paint, provide two (2) heavy coats on aluminum surfaces in contact with dissimilar materials such as concrete, masonry, steel and other metals.

D. Removable aluminum checkered plate or aluminum plank grating shall be fastened to secure checker plate or plank grating to supporting members, as recommended by the manufacturer. Fastening system for the checker plate or plank grating shall be removable.

+ + END OF SECTION + +

SECTION 11207

PARSHALL FLUMES

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. Contractor to furnish all labor, materials, equipment and incidentals to provide one (1) Parshall Flume at the parshall flume vault structure as shown on the drawings and as specified herein. The flume shall be installed, tested and ready for operation.

B. Related Sections: CONTRACTOR shall coordinate the requirements of the Work in this Section along with the requirements of the Sections listed below which includes, but is not necessarily limited to:
   1. Division 1.
   2. Section 05051, Anchor Bolts and Adhesive Anchors.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. ANSI/AWWA F101 – AWWA Standard for Contact-Molded, Fiberglas-Reinforced Plastic Wash Water Troughs and Launders.
B. ASTM D256 – Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.
C. ASTM D570 – Standard Test Method for Water Absorption of Plastics.
D. ASTM D638 – Standard Test Method for Tensile Properties of Plastics.
E. ASTM D790 – Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
F. ASTM D 1941 – Standard Test Method for Open Channel Flow Measurement of Water with the Parshall Flume.
G. ASTM D2583 – Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.
H. ISO 9826 – Measurement of Liquid Flow in Open Channels – Parshall and SANIIRI Flumes.
I. JIS B7553 – Parshall Flume Type Flowmeters.
J. All references shall be of the latest revision.

1.3 SUBMITTALS

A. Submit the following to the ENGINEER for approval:
   1. Units
      a. All submittals, specifications, drawings, brochures, installation instructions, descriptive literature, etc. shall have all units of measurement in both Imperial and SI units.
   2. Drawings
      a. Project specific drawings, showing:
         (a) Critical dimensions.
         (b) Joints, connections, fasteners.
         (c) Sizes, spacing, and locations of structural members, ribs, anchoring clips, and dimensional bracing.
         (d) Materials and thicknesses of construction.
         (e) Minimum and maximum flow rates.

b. Generic layouts or check marked brochures shall be rejected without review.

3. Specifications
   a. Project specific specifications.
   b. Generic or check marked specifications shall be rejected without review.
4. Discharge Tables
   a. Level-to-flow discharge tables, showing:
      (a) Flow equations.
      (b) Submergence transition, where published.
      (c) Accuracy, where published.
      (d) Plan view layout showing critical dimensions and primary point of measurement (Ha).
      (e) Discharge table source.
5. Receiving, Handling, and Storage Instructions
6. Installation Instructions
7. Operation and Maintenance Instructions
8. Product Warranty
9. Test Data
   a. Independent certified test results confirming material properties.
      (a) Test results are to be performed on specimens representative of the resins and reinforcements submitted upon with such resins and reinforcements listed by the certifying party.
      (b) Data shall be no more than three (3) years old.
10. Laminate Sample
    a. 6-inch square sample of representative laminate, upon request.

1.4 RECEIVING, HANDLING, AND STORAGE

A. Receiving
   1. Inspect for damage:
      a. All parts should be inspected upon delivery to the site, noting any missing items or visible damage.
      b. Verify that the interior flow surfaces have not been damaged or otherwise marked during transit.
      c. Flanges, anchor clips, and dimensional bracing should also be inspected.
      d. For smaller boxed items make sure to verify that all packaging seals are in place and that there is no visible damage to the packaging.
   2. Investigate for order correctness and count:
      a. Once the order has been received review the packing list against what has been received. Should any items not appear to be present or the configuration of the items does not match the description on the packing list, contact Openchannelflow immediately.
      b. Small connection hardware (nuts, bolts, etc.) not attached to the flumes ship in individual boxes – with those contents clearly marked. Special care should be taken to secure these and any other small items that can be misplaced on a job site.
   3. Handling
      a. Flumes are specialty items and are fabricated to strict dimensional tolerances. While rugged and designed for a long service life, flumes must be handled with care. Flow surfaces are particularly important and in handling flumes this should always be kept in mind.
      b. When cranes, hoists, and other machinery are used to lift flumes or flume sections, spreader bars and lifting straps should always be used. When performing any overhead lift, all lifting eyes must be used in conjunction with good rigging practices. Rigging and

lifting sequences and schedules of equipment are solely the responsibility of the installing party.

c. Chains, ropes, and the like should never be used to move or position any flume as they may serrate the fiberglass laminate or compromise the protective gel coat surfaces.

4. Storage
   a. Flumes not intended for immediate installation may be stored until the site is ready for their installation.
   b. Flumes should only be stored in a location that is clean, level, and protected from construction traffic.
   c. When shipped on pallets, flumes should be left on those pallets until such time as they are needed. Otherwise flumes should be stored upside down so that the interior flow surfaces are protected. Flumes should then be covered as an additional protection for the flow surfaces.

PART 2 –PRODUCTS

2.1 MANUFACTURER

A. Supply parshall flume manufactured by:
   1. Openchannelflow
   2. TRACOM
   3. Approved Equal

2.2 WARRANTY

A. Flumes shall be warranted to be free of defects in workmanship and materials for five (5) years with a completed warranty registration.

B. The warranty period shall begin from the date of shipment.

2.3 SYSTEM DESCRIPTION

A. Configuration
   1. Single flume
      a. Size:
         (a) 12-inch Parshall flume.
      b. Construction:
         (a) One-piece construction.

B. Materials of Construction
   1. Fiberglass reinforced plastic laminate
      a. ISO certified polyester laminating resin:
         (a) Low VOC.
         (b) Properties shall meet or exceed:

(i) Tensile Strength (ASTM D638)	14,000 psi.
(ii) Flexural Strength (ASTM D790)	22,000 psi.
(iii) Flexural Modulus (ASTM D790)	900,000 psi.
(iv) ANSI/AWWA F101	Type II.
(v) Barcol Hardness (ASTM D2583)	30.
(vi) Water Absorption (ASTM D2583)	<0.15%
(vii) Temperature limit	150° F.

(c) Orthophthalic resins shall not be allowed.
b. E-glass:
(a) Minimum of 30% of laminate content by weight.
(b) Silane coupling agent.
(c) C-glass shall not be allowed.
c. Laminate thickness:
(a) Floor:
(i) 1/4-inch.
(b) Sidewalls:
(i) 1/4-inch.
2. Gel coat:
a. All surfaces must be gel coated.
b. 15 mil cured thickness.
c. U.V. inhibitors in all gel coat formulations, regardless of application or installation location.
d. Color:
(a) Interior surfaces: white gloss.
(b) Exterior surfaces: gray.
3. Dimensional bracing:
a. Removable, gray equal leg pultruded fiberglass bracing with T-304 stainless steel hardware capable of providing sufficient strength and structural support to resist the stresses of shipping and installation (cribbing of the flume is still required during installation).
(a) 2-inch x 2-inch.
4. Flanges:
a. Integral end flanges:
(a) 24-inch diameter.
5. Anchoring clips:
a. Anchor clips chemically bonded to the exterior of the flume to aid in securing the flume during installation.
b. Pre-drilled with Ø5/8-inch hole.

C. Dimensional Tolerances:
1. Flume throat dimensions shall be plus or minus:
a. 1/16-inch.
2. Other flume dimensions shall be plus or minus:
a. 1/8-inch.

D. Level:
1. High-visibility two-axis spirit level mounted at the primary point of measurement, Ha.

2.4 ACCESSORIES

A. End Connections
1. End adapters
a. Inlet end adapter to transition the flow into the flume.
b. Outlet end adapter to transition the flow out of the flume.

B. Flow / Level Options
1. Staff / level gauge

a. High visibility, direct read level gauge with 3/4-inch black letters / numerals on a high visibility yellow-green background.
b. Dual scale gradated in cm, 1/10-foot, and 1/100-foot increments.
c. Gauge must be molded into the flume. Surface applied gauges shall not be allowed.

2. Ultrasonic mounting bracket
   a. Horizontally and vertically adjustable T-304 stainless steel construction.
   b. Capable of simultaneously mounting ultrasonic transducers up to Ø1-inch NPT and temperature sensors up to Ø1-inch NPT.

C. Customization
1. Modified sidewalls
   a. Extended height sidewalls with a total depth coordinated with the construction plans as measured at the primary point of measurement (Ha).
2. Recessed grating
   a. Removable, recessed, narrow opening fiberglass grating with slip resistant top surface.

PART 3 –EXECUTION

A. Examination
1. Verify that the flume dimensions are correct and that the site conditions are suitable for installing the flume.
2. Flumes supplied with bolt-on end adapters or wing walls must remain sealed between the joints. Where required, apply one or two continuous beads of silicone on all seating surfaces before proceeding with the installation.

B. Installation
1. The flat floor of the flume (the crest) should be set upstream.
2. The crest of the flume must be installed level from front-to-back and from side-to-side (using a level on the crest – not the top – of the flume).
3. The inlet of the flume must be set at or above the invert of the inlet channel / pipe. If set higher, a 1:4 (rise:run) slope ramp should be grouted from the channel / pipe to the inlet of the flume. The inlet of the flume should never be below the invert of the channel / pipe. Openchannelflow end adapters have rises / falls built in – for flumes supplied with end adapters this step may be omitted.
4. The outlet of the flume should be set at or above (ideally) the invert of the outlet channel / pipe to help transition solids out of the flume and to minimize the chance of submergence.
5. The internal dimensions of the flume are critical to its proper operation. The flume must be braced internally (plywood and lumber are typically used) during installation to ensure that distortion does not occur. The dimensional bracing on the top of the flume is provided to ensure dimensional accuracy. The bracing should be left on the flume until the installation has been completed. For installations where the flume is set in concrete, the bracing may be removed once the installation has been completed and verified. For installations where the flume is freestanding or otherwise not set in concrete, the bracing should be left in place.
6. Flumes supplied with end adapters and pipe stubs may also be supplied with flexible couplings and stainless steel bands. Considerable force must be exerted by the coupling sealing surfaces during installation, if the coupling installs with little effort or appears loose, stop and contact the coupling manufacturer.
7. Larger flumes may be placed on piers (poured perpendicular to the flow stream) or concrete blocks to allow sufficient access during installation.

8. Key the flume into the concrete by securing the anchoring clips on the sides of the flume to rebar with wire. The anchoring clips are not intended to prevent the flume from floating or shifting during installation.
9. The flume should be weighted as well as lined and braced internally to prevent flotation and / or distortion during installation. Floor distortion is a particular concern on flumes with large, flat bottoms. Make sure to take the necessary steps to avoid distortion before proceeding.
10. Flowable grout should be used to secure the flume in place. The initial lift should be slowly poured from one side of the flume so that the grout will flow under the flume to the other side, thereby helping to eliminate any void areas under the flume.
11. The initial lift should just cover the bottom of the flume and extend no more than 6-inches [15.24 cm] up the sidewalls. It (and all subsequent lifts) should be allowed to set before proceeding. Pouring grout too much or too fast can deform the floor or sides of the flume, shift it out of alignment, or move it out of level. As the grouting continues, periodically check that the sidewalls have not distorted.
12. Use vibrator sticks or chaining to ensure that no void or air pockets remain in the grout. Care must be taken, though, when using a vibrator stick, as excessive use can cause distortion of the flume.
13. On larger flumes, grout one section between piers (or blocks) at a time, letting the grout set before proceeding to the next section. A grout hose may be required due to the distances involved. Flow grout from only one side of the flume.
14. Once the initial pour has set, grout up the sidewalls in 6-10-inch [15.24-25.4 cm] lifts, letting each lift set before proceeding.
15. The finished surface or shoulder of grout should be even with the top of the flume and should be sloped towards the flume so that any overflow will drain back in to the flume.

C. Adjust and Clean
1. Verify that the complete installation meets the criteria above and any additional criteria supplied by the Engineer.
2. Clean the flow surfaces in accordance with the manufacturer's operation and maintenance instructions.
3. Remove all trash and debris, leaving the site in a clean condition.

++ END OF SECTION ++

SECTION 11286

ALUMINUM SLIDE GATES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown on the Drawings, specified and required to furnish and install aluminum slide gates and appurtenances complete and operational.
   2. Included are aluminum slide gates, anchorage systems, and all appurtenances.
   3. Extent of the equipment is shown on the Aluminum Gate contained in Part 2 of this Section.

B. Related Sections: CONTRACTOR shall coordinate the requirements of the Work in this Section along with the requirements of the Sections listed below which includes, but is not necessarily limited to, Work that is directly related to this Section.
   1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Package 0 Division 01 Specification Sections, apply to this Section.
   2. Section 05051, Anchor Bolts, Toggle Bolts and Concrete Inserts.
   3. Section 09900, Painting
   4. Division 16, Electrical.

1.2 QUALITY ASSURANCE

A. Manufacturer's Qualifications:
   1. Manufacturer shall have a minimum of five years of experience of producing substantially similar equipment, and shall be able to shown evidence of at least five installations in satisfactory operation for at least five years.

B. Component Supply and Compatibility:
   1. Obtain all equipment included in this Section regardless of the component manufacturer from a single aluminum slide gate equipment manufacturer.
   2. Aluminum slide gate equipment manufacturer shall review and approve or shall prepare all Shop Drawings and other submittals for all components furnished under this Section.
   3. All components shall be specifically designed for control of service and shall be integrated into the overall equipment design by the aluminum slide gate equipment manufacturer.

C. Source Quality Control:
   1. Shop Tests:
      a. Test each aluminum slide gate fully assembled in the vertical position for proper seating.
      b. Fully open and close gate disc in its guide system to ensure that it operates freely.
      c. Operate and test floor stands, bench stands, and motor operators to ensure proper assembly and operation.

D. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
   1. ASTM A 276, Specification for Stainless Steel Bars and Shapes.
   2. ASTM A 320, Specification for Alloy Steel Bolting Materials for Low-Temperature Service.
   3. ASTM B 21, Specification for Naval Brass, Rod, Bar, and Shapes.
   4. ASTM B 209, Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
   5. ASTM B 308, Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles.
   6. ASTM B 584, Specification for Copper Alloy Sand Castings for General Application.
   7. AWWA-513, Open-Channel Slide and Weir Gates

1.3 SUBMITTALS

A. Shop Drawings: Submit for approval the following:
   1. Fabrication, assembly and installation diagrams.
   2. Manufacturer's literature, illustrations, specifications and engineering data.
   3. Setting drawings, templates, and directions for the installation of anchor bolts and other anchorages.

B. Shop Test Results:
   1. Submit results of the required shop tests.

C. Field Test Results:
   1. Submit a written report giving the results of the required field tests.

D. Operation and Maintenance Manuals:
   1. Submit complete installation, operation and maintenance manuals including test reports, maintenance data and schedules, description of operation and spare parts information.
   2. Furnish Operation and Maintenance Manuals in conformance with the requirements of Division 1 of Package 0.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the site to ensure uninterrupted progress of the Work. Deliver anchor bolts and anchorage devices which are to be embedded in cast-in-place concrete in ample time to prevent delay of the Work.

B. Handle all aluminum slide gates and appurtenances very carefully. Aluminum slide gates which are distorted or otherwise damaged will not be acceptable. Protect all bolt threads and ends from damage and corrosion.

C. Store materials to permit easy access for inspection and identification. Keep steel members off the ground using pallets, platforms and other supports. Protect equipment including packaged materials from corrosion and deterioration.

D. Store all mechanical equipment in covered storage, off the ground, and prevent condensation.

PART 2 - PRODUCTS

2.1 SERVICE CONDITIONS

A. General: Design equipment to be suitable for the process and service conditions described below and in the Aluminum Slide Gate Schedule and the Aluminum Stop Gate Schedule.
   1. Design aluminum slide gates to safely withstand conditions listed in Aluminum Slide Gate Schedule.
   2. Aluminum slide gates shall be substantially watertight with leakage less than 0.1 gpm per foot of seating perimeter at design head.
   3. Manual operators shall turn right to close, unless otherwise specified. Operators shall indicate the direction of operation.
   4. Bolts, studs, cap screws, and adjusting screws shall be of ample section to withstand the force created by operation of the aluminum slide gate under a full head of water.
   5. Aluminum slide gates shall open to not less than 6-inches above the maximum water level in the channel in which they are installed.

2.2 FABRICATION

A. Materials of Construction:
   1. Aluminum: For frame, slide and yoke, ASTM B 209, Alloy 6061; or ASTM B 308, Alloy 6061. All metal for aluminum slide gate parts shall have a minimum thickness of 1/4-inch.
   2. Stainless Steel: For all parts, ASTM A 276 Type 316, unless otherwise specified.
   3. Bronze Casting: For operating nut, thrust nut and lift nut; ASTM B 584 Alloy 865.
   4. All bolts, studs, cap screws and adjusting screws shall be of Type 316 stainless steel.
   5. Bolts and nuts shall have hexagon heads.
   6. Gasket material and installation shall conform to manufacturer's recommendations.

B. Disc:
   1. Fabricate the slide or disc of aluminum plate reinforced with structural shapes attached by welding.
   2. Provide reinforcing to limit deflection under full head to not more than 1/360 of the span.
   3. Extend reinforcing ribs into the guides overlapping the seating surface of the guide.
   4. Weld stem mounting guides to the disc.

C. Disc Guides:
   1. Guides shall be of aluminum incorporating a sandwich type construction using plates and structural angles.
   2. Guides shall be designed for maximum rigidity as columns to take the thrust developed during aluminum slide gate operation under maximum head.
   3. Guides shall extend beneath the opening a sufficient amount to support the disc in the fully open or closed position.

D. Stem:
   1. Operating stems shall be of Type 316 stainless steel of minimum sizes shown on the Drawings or specified.
   2. Design stem to transmit in compression at least 2-1/2 times the rated output of the operating mechanism with a 80 pound effort on the crank or handwheel. Determine the critical buckling load using the Euler column formula, using C = 2. Where hydraulic

cylinder lifts are used, the stem design force shall not be less than 1.25 times the output thrust of the hydraulic cylinder with a pressure equal to the maximum working pressure of the hydraulic fluid supply. Where electric motor driven lifts are used the stem design force shall not be less than 1.25 times the output thrust of the unit in the stalled motor condition.

3. Stems shall have a slenderness ratio (L/R) less than 200.
4. Threaded portion of the stem shall have rolled threads of the Acme type having a surface roughness finish of 16-microinches or less. Join stems of more than one section by stainless steel couplings threaded and keyed, or bored and pinned to the stems. All threaded and keyed couplings of the same size shall be interchangeable. Provide rising stems with an adjustable stop collar on the stem.
5. Connect the stem to the disc by means of a bolted connection.

E. Yoke (For Self Contained Type Gates):
1. Furnish tops of the extended guides with a yoke for mounting of the lifting device.
2. Construct the yoke of structural shapes of sufficient strength to take the full thrust created by operating the gate under the maximum specified head.
3. Attach the yoke to the framework by bolting or welding so as to permit removal of the gate slide and stem.

F. Seals:
1. Mount a specially shaped resilient seal on the bottom of the disc to provide flush-bottom closure for slide gates. As an alternate, a poured urethane seal shall be mounted in the invert of the frame to form a flushbottom seal.
2. Shape of the seal shall produce a seating surface having a minimum width of 3/4-inch, and the seal will extend beyond the seating surface of the frame.
3. Vertical face of the seal shall be in contact with the seating surface of the guide to provide a proper seal at the corners.
4. Provide gates with "J" seals along the sides of the frames for water leakage protection.
5. Provide downward opening gates with "J" seals along the bottom of the frames.
6. Seal shall be fully field-adjustable. Self-adjusting seals are not acceptable.

G. Packing Glands:
1. Provide downward opening aluminum slide gates in covered tanks with a suitable packing gland to prevent the escape of air from the tanks through the stem sleeve.

H. Product and Manufacturer: Provide one of the following;
1. Golden Harvest.
2. Waterman Industries.
3. Rodney Hunt.
4. Or equal

2.3 APPURTENANCES

A. Stem Guide:
1. Stem guides shall be cast iron, bronze bushed, mounted on cast iron brackets.
2. Guides shall be adjustable in two directions and shall be spaced so that stems have a maximum unsupported length of 84-inches.
3. Anchor bolts for stem guides shall be Type 316 stainless steel.

B. Stem Cover:

1. Furnish all stems with a clear polycarbonate or clear butyrate plastic pipe stem cover. Furnish covers with a cast aluminum adaptor for mounting covers to floor stands. Stem covers shall be designed and furnished with gasketing and breathers to eliminate water intrusion into operators and condensation within the covers.
2. Field engrave covers with legible markings showing as a minimum the gate position at 1/4 open, 1/2 open, 3/4 open and full open.

C. Manual Operators:
1. Manual operation shall be by handwheel or crank operated floorstand or benchstand as shown on the Drawings and specified.
2. Handwheel-operated type shall be without gear reduction and crank-operated type will have either a single or double gear reduction, as required. Each type shall be provided with a threaded cast manganese bronze lift nut to engage the operating stem.
3. Provide anti-friction bearings to properly support both opening and closing thrusts.
4. Stands shall operate the aluminum slide gates under the specified operating head with not greater than a 40-pound pull on the crank or handwheel.
5. All components shall be totally enclosed in a cast iron weatherproof housing. Provide positive mechanical seals to exclude moisture and dirt and prevent leakage of lubricant out of the unit.
6. Provide lubricating fittings for all gears and bearings.
7. Stands shall include a cast iron or fabricated steel pedestal designed to position the input shaft approximately 36-inches above the operating floor. An arrow with the word "OPEN" shall be permanently attached or cast on the floorstand indicating the direction of rotation to open the gate.
8. Removable cranks shall be cast iron with a revolving brass grip. Removable handwheel shall be fabricated steel designed for rough treatment and minimum weight.
9. For self contained type gates, the distance between handwheel or crank operator and the operating floor shall be 36-inches minimum and 48-inches maximum.
10. Crank-operated gates shall be provided with nut-operator drives as noted on the Aluminum Slide Gate Schedule.
11. Provide mechanical stops adjustable ±five degrees at each end of travel.

D. Identification: Identify each aluminum slide gate with a stainless steel nameplate stamped with the approved designation as shown in the Aluminum Slide Gate Schedule, below. Nameplate shall be permanently fastened to the aluminum slide gate at the factory.

2.4 SURFACE PREPARATION AND PAINTING

A. Clean, prime coat and finish coat ferrous metal surfaces of equipment in the shop in accordance with the requirements of Section 01600, General Equipment Provisions, and Section 09900, Painting.

B. Coat machined, polished and non-ferrous surfaces bearing surfaces and similar unpainted surfaces with corrosion prevention compound which shall be maintained during storage and until equipment begins operation.

C. Surface preparation and painting shall conform to Section 09900, Painting.

D. CONTRACTOR shall certify, in writing, that the shop primer and coating system conforms to the requirements of Section 09900, Painting.

2.5 ANCHOR BOLTS

A. Furnish anchor bolts and nuts of ample size and strength for the purpose intended, sized by the equipment manufacturer. Provide hooked anchor bolts for direct embedment during placement of concrete, or a two-part epoxy anchoring system for drill-in anchors. Anchor bolt materials shall be Type 316 stainless steel and shall conform to the requirements of Section 05051, Anchor Bolts, Toggle Bolts and Concrete Inserts.

2.6 SPECIAL TOOLS

A. Furnish two sets of any special tools required for normal operation and maintenance.

2.7 LUBRICANTS

A. Furnish all oil and grease as required for initial operation. Use products recommended by the manufacturer.

2.8 GATE SCHEDULE

A. Provide all gates as shown on the Drawings and listed in the schedule. Conform to type, size, operation and other data specified, unless otherwise approved by ENGINEER.

B. Schedule Abbreviation:
   1. Type:
      a. EF - Embedded Frame.
      b. SM - Surface Mounted Frame.
   2. Operator Type:
      a. CO - Crank Operated.
      b. HW - Handwheel.

C. The seating and unseating design head as stated in the Aluminum Slide Gate Schedule is based on the head measured to the centerline of the gate in its closed position.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install aluminum slide gate equipment in accordance with manufacturer's instructions and recommendations.

B. Brace guides and frames during placement of concrete.

C. Set anchor bolts in accordance with approved Shop Drawings and manufacturer's recommendations.

D. Provide minimum of 1-inch of non-shrink grout below all floorstands.

E. Adjust all parts and components as required to provide correct operation.

F. Protection of Aluminum from Dissimilar Materials: Coat all surfaces of aluminum in contact with dissimilar materials such as concrete, masonry, steel and other metals as specified in Section 09900, Painting.

3.2 STARTUP AND FIELD TESTS

A. After CONTRACTOR and ENGINEER have mutually agreed that the equipment installation is complete and ready for continuous operation, CONTRACTOR shall conduct a functional field test and a leakage test of each aluminum slide gate in the presence of ENGINEER to demonstrate that each aluminum slide gate furnished will function correctly and that maximum permissible leakage is not exceeded.
   1. Functional Tests:
      a. Each aluminum slide gate with appurtenances shall be field tested. Tests shall demonstrate to ENGINEER that each part and all parts together function in the manner intended. All necessary testing equipment and manpower shall be provided by CONTRACTOR at his expense. OWNER will furnish all power, and incidental material and labor required for the tests.
   2. Leakage Tests:
      a. Maximum permissible leakage shall be in accordance with the requirements of Article 2.1, above. Excess leakage shall be reduced to meet specified requirements by adjusting the gate, or replacement will be required.
   3. In the event that the CONTRACTOR is unable to demonstrate to ENGINEER that the equipment meets the requirements of the tests, the deficient equipment will be rejected and CONTRACTOR shall adjust and/or modify and retest the equipment as often as necessary to meet the specified requirements. No separate payments shall be made for adjustments and/or modifications.

SCHEDULE 11286 – 1 ALUMINUM SLIDE GATES	
Location:	Effluent Splitter Structure
Designation	G1, See Drawings
Size (inches):	36” Wide (***) x 36” Tall (***)
Quantity:	1
Type:	Upward-Opening, EF to concrete wall
Design Head Seating: Unseating:	 6’-0” 6’-0”
Operator Type:	HW Manual Gear

SCHEDULE 11286 – 2 ALUMINUM SLIDE GATES	
Location:	Effluent Splitter Structure
Designation	G3, G4, G5, G6 See Drawings
Size (inches):	30” Wide (***) x 30” Tall (***)
Quantity:	4
Type:	Upward-Opening, EF to concrete wall
Design Head Seating: Unseating:	 6’-0” 6’-0”
Operator Type:	HW Manual Gear

SCHEDULE 11286 – 3 ALUMINUM SLIDE GATES	
Location:	Effluent Splitter Structure
Designation	G2 See Drawings
Size (inches):	12” Wide (***) x 12” Tall (***)
Quantity:	1
Type:	Upward-Opening, EF to concrete wall
Design Head Seating: Unseating:	 6’-0” 6’-0”
Operator Type:	HW Manual Gear

(***) Verify dimension after concrete work is complete.

++ END OF SECTION ++

SECTION 15051

BURIED PIPING INSTALLATION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install and test all buried piping, fittings, and specials. The Work includes, but is not limited to, the following:
      a. All types and sizes of buried piping, except those specified under other Sections including the Transmission Mains.
      b. Piping beneath structures. (Does not include piping embedded in concrete.)
      c. Supports and restraints.
      d. Pipe encasements.
      e. Work on or affecting existing piping.
      f. Testing.
      g. Cleaning and disinfecting.
      h. Installation of all jointing and gasketing materials, specials, flexible couplings, mechanical couplings, harnessed and flanged adapters, sleeves, tie rods and all other work required to complete the buried piping installation.
      i. Incorporation of valves, meters and special items shown or specified into the piping systems as required and as specified in the appropriate Division 15, Mechanical, Sections.
      j. Unless otherwise specifically shown, specified, or included under other Sections, all buried piping Work required begins at the outside face of structures or structure foundation sand extending away from structure.

B. Coordination:
   1. Review installation procedures under other Sections and coordinate with the Work that is related to this Section.
   2. Section 15051, Buried Pipe Installation, specifies the installation of all buried piping buried in Sections of Division 15, Mechanical. Coordinate with these Sections.

C. Related Sections:
   1. Section 02220, Excavation and Backfill.
   2. Section 02230, Crushed Stone and Gravel.
   3. Section 02710, Drainage Structures.
   4. Section 03300, Cast-in-Place Concrete.
   5. Section 09900, Painting.
   6. Section 15492, Disinfection - Plumbing.
   7. Division 15, Sections on Piping, Valves and Appurtenances.

1.2 QUALITY ASSURANCE

A. CONTRACTOR shall conform to all applicable requirements of Parts 600 and 700 of the Uniform Standard Specifications for Public Work Construction by the Maricopa Association of

Governments (MAG). If there is a conflict between MAG Standard Specifications and these Specifications, the Provisions of these Specifications shall govern.

B. Requirements of Regulatory Agencies:
   1. Comply with requirements of NFPA Standard No. 24 for "Outside Protection" where applicable to water pipe systems used for fire protection.
   2. Comply with requirements of UL, FM and other jurisdictional authorities, where applicable.
   3. Refer to the General and Supplementary Conditions regarding permit requirements for this Work.
   4. Applicable building codes.

C. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
   1. ASTM D2321, Practice for Underground Installation of Flexible Thermoplastic Pipe.
   2. ASTM D2774, Practice for Underground Installation of Thermoplastic Pressure Piping.
   3. AWWA C105, Polyethylene Encasement for Ductile-Iron Piping for Water and Other Liquids.
   4. AWWA C111, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
   5. AWWA C206, Field Welding of Steel Water Pipe.
   6. AWWA C600, Installation of Ductile-Iron Water Mains and Their Appurtenances.
   7. AWWA C606, Grooved and Shouldered Joints.
   8. AWWA C651, Disinfecting Water Mains.
   9. AWWA M9, Concrete Pressure Pipe.
   10. AWWA M11, Steel Pipe - A Guide for Design and Installation.
   11. AWWA M23, PVC - Design and Installation.
   12. ASCE MOP No. 37, Design and Construction of Sanitary and Storm Sewers.
   13. Concrete Pipe Handbook, American Concrete Pipe Association.
   14. NFPA 24, Private Fire Service Mains and Their Appurtenances.
   15. NFPA 54, National Fuel Gas Code.

1.3 SUBMITTAL

A. Shop Drawings: Submit for approval the following:
   1. Laying schedules for all piping.
   2. Full details of piping, specials, manholes, joints, harnessing and connections to existing piping, structures, equipment and appurtenances.

B. Tests: Submit description of proposed testing methods, procedures and apparatus. Prepare and submit report for each test.

C. Certificates: Submit certificates of compliance with referenced standards.

D. Record Drawings:
   1. During progress of the Work, keep an up-to-date set of Record Drawings showing field and shop drawing modifications.
   2. Submit Record Drawings prior to the time of Substantial Completion.

1.4 PRODUCT DELIVERY. STORAGE AND HANDLING

A. Deliver materials to the site to ensure uninterrupted progress of the Work.

B. Handle all pipe, fittings, specials and accessories carefully with approved handling devices. Do not drop or roll material off trucks. Do not otherwise drop, roll or skid piping-

C. Store pipes and fittings on heavy wood blocking or platforms so they are not in contact with the ground.

D. Unload pipe, fittings and specials opposite to or as close to the place where they are to be installed as is practical to avoid unnecessary handling. Keep pipe interiors completely free from dirt and foreign matter.

E. Inspect delivered pipe for cracked, gouged, chipped, dented or other damaged material and immediately remove defective pipe from site.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Required pipe materials are listed in the Piping Schedule. Refer to applicable Sections for material specifications.

B. General:
   1. Marking Piping:
      a. Clearly mark each piece of pipe or fitting with a designation conforming to those shown on the laying schedule and/or Shop Drawings.
      b. Cast or paint material, type and pressure designation on each piece of pipe or fitting 4-inches in diameter and larger.
      c. Pipe and fittings smaller than 4-inches in diameter shall be clearly marked by manufacturer as to material, type and rating.

C. CONTRACTOR shall be responsible to coordinate compatible materials of construction for all elastomer components for all seats, seals, gaskets, etc., for each process application.

2.2 DETECTABLE PIPE LOCATING TAPE

A. General:
   1. CONTRACTOR shall furnish OWNER any information upon request so that the products furnished may be properly evaluated for acceptance or rejection. Only products of approved manufacture will be accepted.
   2. Detectable pipe locating tape shall consist of a minimum 5.0 mil thickness, inert polyethylene plastic which is impervious to all known alkalis, acids, chemical reagents and solvents likely to be encountered in the soil, with a minimum 1/3mil metallic foil. The tape shall be at least six inches in width and shall have the following identifying print in permanent letters:

      "CAUTION - BURIED PIPELINE BELOW”

      The identifying lettering shall be minimum one inch high and repeated continuously the full length of the tape. In no instance shall the spacing of the individual segment of the identifying message be greater than eight inches.

3. All detectable pipe locating tape shall be color coded by service, as directed by OWNER. CONTRACTOR shall submit color chart to the OWNER for approval, identifying lettering shall match the buried piping schedule. Refer to Paragraph 3.8 of this Section

B. Product and Manufacturer: Provide one of the following:
   1. Reef Industries, Inc.
   2. Alarmatape
   3. Linetec, Inc.
   4. Or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:
   1. Installation of all pipe, fittings, valves, specials and appurtenances shall be subject to the review and/or approval of the OWNER.
   2. Install piping as shown, specified and as recommended by the manufacturer and in conformance with referenced standards, and approved Shop Drawings.
   3. Request instructions from OWNER before proceeding if there is a conflict between the manufacturer's recommendations and the Contract Documents.
   4. All piping shall be inspected by the OWNER prior to installation. OWNER'S inspection will not relieve CONTRACTOR or manufacturer from responsibility for damaged products.
   5. All piping shall be carefully examined for cracks, damage or other defects before installation. Any piping that is defective, including but not limited to, cracked, damaged, in poor condition, or with damaged linings or improper markings shall be rejected unless the product can be repaired in a manner acceptable to the manufacturer and OWNER. Any piping found to be broken or defective after it has been installed shall be removed, replaced or repaired at CONTRACTORS expense.
   6. Minimum earth cover over the piping shall be as shown on the Drawings, specified or directed by the OWNER, but in no case shall the earth cover be less than 3-feet-6-inches for all piping, except drains.
   7. Required earthwork shall be as specified in applicable Sections of Division 2, Site Work.
   8. Present all conflicts between piping systems and equipment, structures or facilities to OWNER for determination of corrective measures before proceeding.
   9. Take field measurements, where required, prior to installation to ensure proper fitting of Work. The CONTRACTOR shall uncover the existing pipelines sufficiently in advance of the proposed Work in order that the type and location of the existing pipes and joints and other information required to fabricate the proposed piping can be determined. It shall be the responsibility of the CONTRACTOR to obtain whatever information is required to complete the connections of the proposed pipelines to the existing pipelines. Refer to Paragraph 3.3 of this Section, as applicable.
   10. Interior of all piping and mating surfaces shall be inspected and all dirt, gravel, sand, debris or other foreign material shall be completely removed from the interior and mating surfaces before installation. Measures shall be taken to maintain the interior of all piping clean until acceptance of the completed Work. Care shall be taken to prevent foreign matter from entering joint space. Bell and spigot mating surfaces shall be wiped clean immediately before piping is laid. For ductile-iron pipe, the bell and spigot mating surfaces shall be thoroughly cleaned with a wire brush.

11. Install piping accurately to line and grade shown, specified or directed, unless otherwise approved by the OWNER. Accurate means of determining and checking the alignment and grade shall be used, which shall be subject to the approval of the OWNER. Any modifications to the Contract Documents to suit the pipe manufacturer's standard shall be approved by the OWNER. Remove and relay piping that is incorrectly installed, at CONTRACTOR'S expense.
12. Do not lay piping in water, unless otherwise specified in these Specifications or approved by the OWNER. Ensure that the water level in the trench is at least 6-inches below the bottom of piping. Maintain a dry trench until jointing and backfilling are complete, unless otherwise specified in these Specifications or approved by the OWNER.
13. Where unforeseen conditions will not permit the installation of piping as shown or specified, no piping shall be installed without approval of the OWNER. Do not modify structures or facilities without approval of the OWNER.
14. Start laying piping at lowest point and proceed toward the higher elevations, unless otherwise approved by the OWNER. Slope piping uniformly between elevations shown on the Drawings or as otherwise directed by the OWNER.
15. Place bell and spigot piping so that the bells face the direction of laying, unless otherwise approved by the OWNER.
16. Piping shall be installed so that the barrel of the piping, and not the joints, receives the bearing pressure from the trench bottom or other bedding condition.
17. No piping shall be brought into position until the preceding length, valve, fitting, or special has been bedded and secured in place.
18. Whenever pipe laying is not actively in progress, the open ends of the piping shall be closed by a temporary plug or cap to prevent soil, water and other foreign matter from entering the piping.
19. Field cutting of metallic piping, where required for inserting valves, fitting, specials, and closures, shall be made with a machine specially designed for cutting piping and in accordance with the manufacturer's instructions. Cuts shall be carefully done, without damage to piping, so as to leave a smooth end at right angles to the axis of the piping. Cut end shall be tapered and sharp edges filed off smooth. Flame cutting shall not be permitted. Piping damaged by CONTRACTOR by improper or careless methods of cutting shall be replaced or repaired at his expense.
20. Blocking under piping shall not be permitted unless specifically approved by OWNER for special conditions.
21. Protective linings and coatings shall be touched up prior to installation, where required.
22. Except where bends, wyes or similar fittings are used, changes in alignment and grade of the piping shall be made by deflecting joints or with beveled pipe. Permissible joint deflection shall not exceed 75 percent of the amount allowed by the manufacturer.
23. All joints shall be made in the presence of the OWNER or his duly authorized representative, except as otherwise approved.
24. Special care shall be taken to ensure that each section of piping abuts against the next in such a manner that there will be not shoulder or unevenness of any kind along the piping invert.
25. Piping shall be rotated as required to place outlets in proper position.
26. Blind flanges and cleanouts shall be provided at locations shown on the Drawings, specified or required. Cleanouts on buried piping shall include all pipe, fittings and appurtenances required to bring cleanout to finished grade and terminate in a flange and blind flange or suitably capped piping as shown. Cleanout piping shall be same as that specified for the main run.
27. All gravity lines shall pitch uniformly at the grade shown or as specified or approved.
28. Short pipe stubs, maximum 4-feet-0-inch in length, shall be used at all manholes and other wall faces, except as otherwise specified.

29. Field painting shall be accomplished after joints are made.
30. All piping shall be plugged watertight with a suitable cap or plug securely fastened to the end of the piping at all contact interfaces.
31. CONTRACTOR shall notify OWNER in advance of backfilling operations.
32. On steep slopes, take measures acceptable to OWNER to prevent movement of the pipe during installation.
33. Thrust Restraint: During the installation of the pipe, tied joints, or proprietary restrained joint systems shall be provided wherever required for thrust restraint. Thrust restraint shall conform to the applicable requirements of Paragraph 3.2. of this Section. Thrust blocks are not permitted.
34. Exercise care to avoid flotation when installing pipe in cast-in-place concrete.

B. Manufacturer's Installation Specialist:
   1. Provide the services of a competent installation specialist of the pipe manufacturer when pipe laying begins if CONTRACTOR is not experienced in laying and jointing a particular type of pipe.
   2. Retain installation specialist at the site for a minimum of two days or until competency of the pipe laying crew has been satisfactorily demonstrated.

C. Separation of Sewers and Potable Water Pipe Lines:
   1. Conform to requirements of Arizona Wastewater Disposal Regulations, R18-9-811, as published by The Bureau of National Affairs, Inc.

D. Plugs:
   1. Temporarily plug installed pipe at the end of each day's work or other interruption to the installation of any pipe line. Plugging shall prevent the entry of animals, liquids or persons into the pipe or the entrance or insertion of deleterious materials.
   2. Install standard plugs into all bells at dead ends, tees or crosses. Cap all spigot ends.
   3. Fully secure and block all plugs and caps installed for pressure testing to withstand the specified test pressure.
   4. Where plugging is required for phasing of the Work or for subsequent connection of piping, install watertight, permanent type plugs.

E. Bedding Pipe: Bed pipe as specified below and in accordance with the details shown.
   1. Trench excavation and backfill and bedding materials shall conform to the requirements of Section 02220, Excavation and Backfill, as applicable.
   2. Where the existing bedding material is deemed unsuitable by OWNER, remove and replace it with approved granular materials. Payment for the additional excavation and granular material refill will be made at the unit prices bid in the Bid Form.
   3. Where pipe is installed in rock excavation, provide a minimum of 3-inches of crushed stone or gravel under pipes smaller than 4-inches in diameter and a minimum of 6-inches of crushed stone or gravel under pipes 4-inches in diameter and larger.
   4. Excavate trenches below the pipe bottom by an amount specified. Remove all loose and unsuitable material from the trench bottom.
   5. Carefully and thoroughly compact all pipe bedding with hand held pneumatic compactors.
   6. Do not lay pipe until the OWNER approves the bedding condition. If a conflict exists, obtain clarification from OWNER before proceeding.
   7. No pipe shall be brought into position until the preceding length has been bedded and secured in its final position.

F. Laying Pipe:
   1. Conform to manufacturer's instructions and requirements of the standards listed below, where applicable:
      a. Ductile-Iron Pipe: AWWA C600, AWWA C105.
      b. Steel Pipe: AWWA M11, AWWA C206.
      c. Thermoplastic Pipe: ASTM D 2774.
      d. ASCE Manual of Practice No. 37.
      e. Concrete Pressure Pipe: AWWA M9.

G. Polyethylene Encasement:
   1. Provide polyethylene encasement for all buried pipe, fittings and valves to prevent contact between the pipe and surrounding bedding material and backfill.
   2. Polyethylene may be supplied in tubes or in sheet material.
   3. Polyethylene encasement materials and installation shall be in accordance with the requirements of MAG Section 610.5. Provide the color blue for water and green for sewer and other piping systems, as approved by the OWNER.

H. Jointing Pipe:
   1. Ductile-Iron Mechanical Joint Pipe:
      a. Wipe clean the socket, plain end and adjacent areas immediately before making joint. Make certain that cut ends are tapered and sharp edges are filed off smooth.
      b. Lubricate the plain ends and gasket with soapy water or an approved pipe lubricant, in accordance with AWWA C 111, just prior to slipping the gasket onto the plain end of the joint assembly.
      c. Place the gland on the plain end with the lip extension toward the plain end, followed by the gasket with the narrow edge of the gasket toward the plain end.
      d. Insert the pipe into the socket and press the gasket firmly and evenly into the gasket recess. Keep the joint straight during assembly.
      e. Push gland toward socket and center it around pipe with the gland lip against the gasket.
      f. Insert bolts and hand tighten nuts.
      g. Make deflection after joint assembly, if required, but prior to tightening bolts. Alternately tighten bolts 180 degrees apart to seat the gasket evenly. The bolt torque shall be as follows:

Pipe Size (inches)	Bolt Size (inches)	Range of Torque (ft-lbs)
3	5/8	45-60
4-24	3/4	75-90
30-36	1	100-120
42-48	1-1/4	120-150

      h. All bolts and nuts shall be heavily coated with two 10-mil minimum coats of coal-tar epoxy coating as manufactured by Tnemec in accordance with Section 09900, or equal.
      i. Restrained mechanical joints shall be in accordance with Section 15061, Ductile-Iron Pipe.

   3. Proprietary Joints:
      a. Pipe which utilizes proprietary joints such as Fastite, by American Cast Iron Pipe Company, Tyton by U.S. Pipe Incorporated, restrained joints described under Paragraph

3.2., or other such joints shall be installed in strict accordance with the manufacturer's instrucitons.

4. Steel Pipe Joints:
   a. Joints in steel pipe shall be butt welded joints, except that flexible couplings, mechanical couplings, or flanged connections shall be provided at connections to valves, meters and similar equipment.
   b. Welding shall conform to the requirements of AWWA C206. Pipe 36-inches in diameter and larger shall be welded both inside and outside of the pipe.
   c. After welding, the joint and the surrounding damaged or uncoated area shall be coated with the same material and to the same thickness as the shop applied coating.
   d. Where flanged connecitons or couplings are provided, the flanges, couplings, bolts and nuts shall be coated with two 8-mil coats of high-build epoxy coating as manufactured by Tnemec, or equal.
5. Concrete Cylinder Pipe Joints:
   a. Immediately before making the joint, completely clean the bell and spigot surfaces to be jointed.
   b. Apply a lubricant supplied by the pipe manufacturer to the sealing surfaces of the bell and spigot and the gasket. After lubricaiton, install the gasket in the spigot groove and ensure that the stretch in the gaset is equalized.
   c. After the pipe is lowered into place, align the spigot and bell so that the spigot will squarely enter the bell.
   d. Before the joint is fully assembled, check the position of the gasket it in the bell using methods recommended by the pipe manufacturer and approved by the OWNER.
   e. If the gasket is found to be in the correct position around the entire circumference of the bell, remove temporary joint stoppers, if used, and shove the pipe completely home. If the gasket is not in the proper location, the joint shall be opened and reinstalled using a new gasket.
   f. Where a joint opening is required to make a grade or-alignment adjustment, the joint shall be installed completely closed first, then opened as necessary on one side. Joint openings shall not be greater than 75 percent of the maximum opening recommended by the pipe manufacturer.
   g. Strap a diaper to the outside of the completed joint straddling the external joint recess. Pour a grout mix consisting of Portland cement and sand in proportions recommended by the pipe manufacturer to completely fill the external joint recess. In lieu of the joint diaper CONTRACTOR may, with written approval of the pipe manufacturer, use a polyurethane foam joint protector with unhydrated Portland cement dispersed throughout the protector. The protector shall have the cross-sectional shape required for the type of joint being installed and shall be formed in a loop to fit the size of pipe on which it is to be used.
   h. Point interior joint recess with Portland cement/sand mortar mixed in proportions recommended by the pipe manufacturer. Strike off grout smooth with the interior face of the pipe.
   i. Coat all exterior exposed steel portions of the pipe, flanges, couplings, bolts and nuts with two 8-mil coats of high-build epoxy coating as manufactured by Tnemec, or equal.
   j . Maintain a sufficient quantity of joint lubricant, gaskets, joint diapers and joint fillers at the site of the Work at all times.
   k. Do not use gaskets that have been scored or otherwise damaged. Where welded joints are required to handle thrust, the steel spigot shall be cut at the trailing edge of the gasket groove to provide a surface suitable for welding in the field. All field welded joints shall be full circumferential welds designed to take the thrust at the joint location. A minimum 3/16-inch weld is required. The exposed steel surface of the pipe joints shall have a

temporary protection system of a rust and corrosion inhibitor applied which need not be removed prior to welding. After welding is complete, the joint protection shall be completed with interior and exterior cement mortar grouting.

6. Thermoplastic Pipe Joints:
   a. Solvent Cement Joints:
      1) Bevel pipe ends and remove all burrs before making joints. Clean both pipe and fittings thoroughly. Do not attempt to make solvent cement joints if temperature is below 40 degrees F or above 90 degrees F when exposed to direct sunlight or in wet conditions.
      2) Use solvent cement supplied or recommended by the pipe manufacturer.
      3) Apply joint primer and solvent cement and assemble joints in strict accordance with the recommendations and instructions of the manufacturer of the joint materials and the pipe manufacturer.
      4) Observe safety precautions with the use of joint primers and solvent cements. Allow air to circulate freely through pipelines to permit solvent vapors to escape. Slowly admit water when flushing or filling pipelines to prevent compression of gases within pipes.
   b. Push-On Joints:
      1) Bevel all field-cut pipe, remove all burrs and provide a reference mark the correct distance from the pipe end.
      2) Clean the pipe end and the bell thoroughly before making the joint. Insert the 0-ring gasket, making certain it is properly oriented. Lubricate the spigot well with an approved lubricant; do not lubricate the bell or 0-ring. Insert the spigot end of the pipe carefully into the bell until the reference mark on the spigot is flush with the bell.
7. Copper Tubing Joints:
   a. Assemble copper tubing with soldered joints. Solder shall be 95-5 tin-antimony solder conforming to ASTM B 32.
   b. Ream or file pipe to remove burrs.
   c. Clean and polish contact surfaces of joints.
   d. Apply flux to both male and female ends.
   e. Insert end of tube into full depth of fitting socket.
   f. Heat joint evenly.
   g. Form continuous solder bead around entire circumference of joint.
   h. Runs shall contain unions at connection to equipment and at reasonable distances along the lengths of runs to permit convenient disassembly of piping and removal of equipment.
8. Mechanical Coupling Joints:
   a. Prior to the installation and assembly of mechanical couplings, the joint ends shall be cleaned thoroughly with a wire brush to remove foreign matter. Following this cleaning, lubricant shall be applied to the rubber gasket or inside of the coupling housing and to the joint ends. After lubrication, the gasket shall be installed around the joint end of the previously installed piece and the joint end of the subsequent piece shall be mated to the installed piece. The gasket shall be positioned and the coupling housing placed around the gasket and over the grooved or shouldered joint ends. The bolts shall be inserted and the nuts screwed up tightly by hand. The bolts shall then be tightened uniformly in order to produce an equal pressure on all parts of the housing. When the housing clamps meet metal to metal, the joint is complete and further tightening is not required.

I. Backfllling:
   1. Conform to the applicable requirements of Section 02220, Excavation and Backfllll.

2. Place backfill as construction progresses. Backfill by hand and use power tampers until pipe is covered by at least one foot of fill.

J. Connections to Valves and Hydrants:
   1. Install valves and hydrants as shown.
   2. Provide suitable adapters when valves or hydrants and piping have different joint types.
   3. Provide thrust restraint at all hydrants and at valves at pipeline terminations.

K. Transitions from One Type of Pipe to Another:
   1. Provide all necessary adapters, specials and connection pieces required when connecting different types and sizes of pipe or connecting pipe made by different manufacturers.

L. Closures:
   1. Provide all closure pieces shown or required to complete the Work.

3.2 THRUST RESTRAINT

A. Provide thrust restraint on all pressure piping systems and where otherwise shown and specified. All piping and appurtenances of the Work shall be restrained the complete length including all fittings, valves and appurtenances. Pipe joints shall be restrained as specified in Paragraph 3.2.C. below.

B. Thrust restraint shall be accomplished by means of restrained pipe joints. Concrete thrust blocks are not permitted. Thrust restraints shall be designed for the axial thrust exerted by the test pressure given in the Buried Piping Schedule.

C. Restrained Pipe Joints:
   1. Pipe joints shall be restrained by means suitable to the type of pipe being provided and in accordance with MAG standard detail No. 302 unless otherwise directed by the OWNER or required.
      a. Concrete cylinder and steel pipe shall be restrained utilizing welded joints. Concrete pipe requiring restraint shall have sufficient longitudinal steel reinforcement provided to handle the thrust forces at a maximum design stress of 12,500 psi. The thrust forces in the longitudinals must be transmitted directly to the steel joint bands using welded connections sufficient to carry the stresses involved. No allowance for the concrete to handle any tensile forces is permitted. Concrete cylinder pipe thrust restraint shall be in accordance with AWWA Manual M-9, Chapter 7.
      b. Ductile-iron push on joints and mechanical joints shall be restrained utilizing a proprietary restrained joint system such as American Lok-Ring, Lok-Fast, Lok-Set U.S. Pipe Field Lok Gasket, U.S. Pipe TR Flex System, lugs, and tie rods, or other system approved by OWNER.
      c. Steel pipe shall have butt-welded joints, flanged joints, or flexible or mechanical harnessed couplings. Tie rods connected to ears welded to the steel pipe shall be provided for restraint at all flexible coupling connectors.
      d. Thermoplastic and copper piping shall generally be installed with soldered, solvent weld, threaded, flanged, or similar type joints. Where push-on type or other non-restrained joints are provided, the CONTRACTOR shall provide tie rods or other suitable joint restraint system for these joints, subject to the approval of OWNER.

e. Harnessed lengths for buried pipe shall be determined by the pipe manufacturer in accordance with the formula for determination of harnessed lengths.

3.3 WORK AFFECTING EXISTING PIPING

A. Location of Existing Piping:
   1. Locations of existing piping shown should be considered approximate.
   2. CONTRACTOR shall determine the true locations of existing piping to which connections are to be made, and locations of other facilities which could be disturbed during earthwork operations, or which may be affected by CONTRACTOR'S Work already installed.
   3. Conform to applicable requirements of Division 1, General Requirements, pertaining to cutting and patching and connections to existing facilities.

B. Work on Existing Pipelines:
   1. Cut or tap pipes as shown or required with machines specifically designed for this Work.
   2. Install temporary plugs to prevent entry of mud, dirt, water and debris.
   3. Provide all necessary adapters, fittings, pipe and appurtenances required to complete the Work.

3.4 TESTING OF PIPING

A. General:
   1. Test all piping, except as otherwise authorized by OWNER.
   2. Notify OWNER 48 hours in advance of testing.
   3. Provide all testing apparatus, including pumps, hoses, gages, and fittings.
   4. Unless otherwise noted, pipelines shall hold specified test pressure for two hours.
   5. Repair and retest pipelines that fail to hold specified test pressure or which exceed the allowable leakage rate.
   6. Unless otherwise specified, test pressures required are at the lowest elevation of the pipeline section being tested.
   7. Conduct all tests in the presence of OWNER.
   8. Advise local authorities having jurisdiction if their presence is required during testing.

B. Schedule of Pipeline Tests:
   1. Test piping at the test pressure listed in the Buried Piping Schedule.
   2. All piping shall be water tested after installation, except as otherwise specified or directed by OWNER.
   3. For piping not included in the Schedule, the OWNER will notify CONTRACTOR, in writing, of the test pressure to be used.

C. Pressure Test Procedure:
   1. Complete backfill and compaction at least to the pipe centerline before testing, unless otherwise required or approved by OWNER.
   2. Fill section to be tested slowly with water and expel all air. Install corporation cocks, if necessary, to remove all air.
   3. Test only one section of pipe at a time.
   4. Apply specified test pressure for two hours and observe pressure gage. Check carefully for leaks while test pressure is being maintained.

D. Leakage Testing:
   1. Conduct leakage test for all liquid piping after satisfactory completion of pressure test.

2. Allow concrete pipe to stand full of water at least 12 hours prior to starting leakage test.
3. Maintain test pressure constantly for the minimum test period and accurately measure the amount of water which must be added to maintain the test pressure.
4. Allowable Leakage Rates (in gallons per hour per 1,000 feet per inch diameter):
    a. DIP Push On or Mechanical Joints: 0.075
    b. Concrete, Pressure: 0.2
    c. Concrete, Reinforced: 1.0
    d. Copper, Steel, FRP, and Thermoplastic: None
5. Leakage Test Procedure:
    a. Examine exposed pipe, joints, fittings and valves. Repair visible leakage or replace the defective pipe, fitting or valve.
    b. Refill the line under test to reach the required test pressure.
    c. Provide a test container filled with a known quantity of water at the start of the test. Attach the test pump suction to the test container.
    d. Pump water from the test container into the line with the test pump to hold the specified test pressure for the test period. Water remaining in the container shall be measured and the amount used during the test shall be recorded on the test report.
    e. Perform all repair, replacement, and retesting as directed by the OWNER because of failure to meet testing requirements.
    f. Leakage shall be less than rate specified above.

E. Vertical Deflection Test for Thermoplastic Pipe:
1. After completion of backfill and at a time approved by OWNER, CONTRACTOR shall manually pull a pin-type vertical gage mounted on a sled through the pipe. Gage shall be set so that if vertical deflection of pipe exceeds 5 percent, it will stop. CONTRACTOR shall excavate and relay all such piping. Gage shall be as manufactured by Quality Test Products, or equal.

3.5 DISPOSAL OF WATER

A. CONTRACTOR shall provide suitable means for disposal of test and flushing water so that no damage results to facilities or waterways.

B. Means of disposal of test and flushing water shall be subject to the approval of OWNER, local governing authorities and regulatory agencies.

C. CONTRACTOR shall be responsible for any damage caused by his water disposal operations.

3.6 CLEANING

A. Cleaning:
1. Thoroughly clean all piping and flush prior to placing in service in a manner approved by the OWNER.
2. Piping 24-inches in diameter and larger shall be inspected from inside and all debris, dirt and foreign matter removed.
3. If piping that requires disinfection has not been kept clean during storage or installation, CONTRACTOR shall swab each section individually before installation with a 5 percent hypochlorite solution, to ensure clean piping.

B. Disinfection:

1. Disinfect all potable water piping.
2. Disinfection shall conform to the requirements of Section 15492, Disinfection, Plumbing.

3.7 INSTALLATION OF DETECTABLE PIPE LOCATING TAPE

A. Underground Pipe Locating Tape:
   1. Detectable pipe locating tape shall be placed above all underground pipelines three inches in diameter or greater. Tape shall be buried 12 inches below finished grade directly above entire pipeline length.

3.8 PIPING SCHEDULE

The following abbreviations are used in the Buried Piping Schedule included at the end of the Section.

A. Material Abbreviations

Cast Iron	CI	Polyvinyl Chloride	PVC
Fiberglass Reinforced Plastic	FRP	Double Containment Chlorinated Polyvinyl Chloride	DCCPVC
Ductile Iron	DI	Polyethylene	PE
Copper	C	Prestressed Concrete Cylinder Pipe	PCCP
Carbon Steel	CS	Double Containment High Density Polyethylene	DCHDPE
High Density Polyethylene	HDPE	Reinforced Concrete Pipe	RCP
Stainless Steel	SST	Double Containment Fiberglass Reinforced Plastic	DCFRP
Chlorinated Polyvinyl Chloride	CPVC		

B. Lining/Coating Abbreviations

Cement Mortar Coated	CC	Galvanized	Galv
Cement Mortar Lined	CL	Plastic Lined	PL
Glass Lined	GL	Painted	P
Bituminous Coated	BC	Polyethylene Encasement	PE
Epoxy Lined	EL	Tape Wrap	TW
CLSM Encasement	CLSM		

C. Joint Abbreviations

Bell and Spigot	BS	Compression Flange Adapter	CFA
Flanged	Flg	Soldered	Sd
Mechanical Joint	MJ	Brazed	Bz
Screwed Fittings	S	Grooved or Shouldered End Couplings	GSEC
		Compression Sleeve Coupling	CSC
Butt Welded	BW	Solvent Welded	SW

BURIED PIPING SCHEDULE

Service	Material	Interior Lining	Exterior Coating	Thickness / Class	Joint	Pressure Test (psig)
30-Inch Effluent from Chlorine Contact Basin to the New Effluent Splitter Box	DI	CL	PE	150 psi	MJ Restrained	150
24-inch Effluent (to new recharge basins and wash)	PVC (C905)	See Specification 15293				
8-inch Effluent fron New Effluent Splitter Box to Existing Recharge Basin Piping Connection	PVC (C900)	See Specification 15292				

+ + END OF SECTION + +

SECTION 15061

DUCTILE-IRON PIPE

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install ductile-iron pipe and fittings.
   2. The extent of the piping is shown on the Drawings and in the Schedules included in Section 15051, Buried Piping Installation.

B. Related Sections:
   1. Section 02220, Excavation and Backfill.
   2. Section 09900, Painting.
   3. Section 15051, Buried Piping Installation.
   4. Section 15052, Exposed Piping Installation.
   5. Section 15211, Wall Pipes, Floor Pipes and Pipe Sleeves.
   6. Section 15212, Piping Specialties and Accessories.
   7. Section 15220, Pipe Hangers and Supports.

1.2 QUALITY ASSURANCE

A. Manufacturer's Qualifications:
   1. Manufacturer shall have a minimum of five (5) years of experience producing ductile-iron pipe and fittings, and shall show evidence of at least five (5) installations in satisfactory operation.
   2. Ductile iron pipe and fittings shall be the product of one (1) manufacturer.

B. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
   1. AWWA C 104, Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
   2. AWWA C 110, Ductile-Iron and Gray-Iron Fittings, 3-inch through 48-inch, for Water and Other Liquids.
   3. AWWA C111, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
   4. AWWA C 115, Flanged Ductile-Iron Pipe with Threaded Flanges.
   5. AWWA C 150, Thickness Design of Ductile-Iron Pipe.
   6. AWWA C 151, Ductile-Iron Pipe, Centrifugally Cast," for Water or Other Liquids.
   7. ANSI B 16.1, Cast Iron Pipe Flanges and Flanged Fittings.
   8. ANSI B 18.2.1, Square and Hex Bolts and Screws Inch Series, Including Hex Cap Screws and Lag Screws.
   9. ANSI B 18.2.2, Square and Hex Nuts.
   10. ASTM A 307, Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
   11. ASTM A 354, Specification for Quenched and Tempered Alloy Steel Bolts, Studs and Other Externally Threaded Fasteners.
   12. AWWA C600, Installation of Ductile-Iron Water Mains and Their Appurtenances.
   13. AWWA C606, Grooved and Shouldered Type Joints.

1.3 SUBMITTALS

A. Shop Drawings: Submit for approval the following:
   1. Detailed drawings and data on pipe, fittings, gaskets and appurtenances. Submit these with Shop Drawings required under Section 15051, Buried Piping Installation, and Section 15052, Exposed Piping Installation.

B. Certificates: Submit certificates of compliance with referenced standards.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Refer to Section 15051, Buried Piping Installation, and Section 15052, Exposed Piping Installation.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Joints shall be as specified in piping schedules in Section 15051, Buried Piping Installation and Section 15052, Exposed Piping Installation. If not specified, provide flanged joints for exposed piping and push-on or mechanical joints for buried piping. Couplings shall be provided on pipe with plain or grooved ends, where shown or where approved by OWNER.

B. Ductile-Iron Pipe and Fittings:
   1. Flanged Pipe: Fabricate in accordance with requirements of AWWA C115.
      a. Thickness: Class 53.
   2. Non-Flanged Pipe: Conform to AWWA C151 for material, pressure, dimensions, tolerances, tests, markings and other requirements.
      a. Pressure: As shown on piping schedules.
      b. Thickness Class 53.
   3. Joints:
      a. Flanged Joints: Conform to AWWA C110 and C115 capable of meeting working and test pressure specified in Section 15051, Buried Piping Installation, and Section 15052, Exposed Piping Installation.
         1) Gaskets: High temperature resistant sealing compounds (Loctite PST 592) or equivalent with Dimethacrylate ester base and teflon can be used.
            a) Gaskets: Unless otherwise specified, gasket stock shall be a synthetic rubber, 1/8-inch thick, full face, compound in which the elastomer is nitrile or neoprene. The compound shall contain not less than 50 percent by volume nitrile or neoprene and shall be free from factice, reclaimed rubber and other deleterious substances. Gaskets shall comply with AWWA C111 for push on and mechanical joints.
         2) Bolts and Nuts: Conform to ANSI B18.2.1 and ANSI B18.2.2, respectively. Exposed bolts and nuts shall be ASTM A 307, Grade B. Buried or submerged bolts, nuts and washers shall be Type 316 stainless steel.
      b. Mechanical Joints: Conform to AWWA C110 and AWWA C111.
         1) Glands: Ductile iron.
         2) Gaskets: Plain Tip.
         3) Bolts and Nuts: High strength, low alloy steel.

c. Push-On Joints: Conform to AWWA C111.
    1) Gaskets: Molded rubber.
    2) Stripes: Each plain end shall be painted with a circular stripe to provide a guide for visual check that joint is properly assembled.
d. Restrained Joints: Restrained push-on joints shall be capable of being deflected after full assembly. Joint assembly shall be in strict conformance with AWWA C600 and manufacturer's recommendations. No field cuts of restrained pipe are permitted without prior approval of the OWNER.
e. Restrained Joints:
    1) Restrained joints for mechanical joint piping shall be one of the following:
        a) Megalug as manufactured by EBBA Iron Sales, Inc.
        c) Or equal.

4. Flanged fittings: Conform to AWWA C110 and C115.
    a. Pressure Rating: 150 psig.
    b. Material: Ductile-iron.
    c. Gaskets: As specified above for joints.
    d. Bolts and Nuts: As specified above for joints.
5. Mechanical Joint Fittings: Conform to AWWA C110.
    a. Pressure Rating: 150 psig.
    b. Material: Ductile-iron.
    c. Glands: Use ductile-iron glands only. Cast iron glands are not allowed.
    d. Gaskets: As specified above for joints.
    e. Bolts and Nuts: As specified above for joints.
6. Coatings and Linings:
    a. Where shown on the pipe schedules, pipe and fittings shall be lined with a bituminous seal coated cement-mortar lining in accordance with AWWA C104.
    b. Buried pipe and fittings shall be coated on the outside with a bituminous coating, approximately 1-mil thick. Buried pipe shall be provided with polyethylene encasement in accordance with Section 15051, Buried Piping Installation. Exposed pipe shall be prime coated in accordance with Section 09900, Painting.
7. Epoxy Lining Material: Epoxy lining shall be provided. The material shall be an amine cured novalac epoxy containing at least 20 percent by volume of ceramic quartz pigment. Epoxy lining material manufacturer shall demonstrate a successful history of lining pipe and fittings for sewer service and submit a test report verifying the following properties, and a certification of the test results.
    a. A permeability rating of 0.00 when tested according to Method A of ASTM E-96-66, Procedure A with a test duration of thirty (30) days.
    b. The following test shall be run on coupons from factory lined ductile iron pipe:
        1) ASTM B-117 Salt Spray (scribed panel) - Results to equal 0.0 undercutting after two (2) years.
        2) ASTM G-95 Cathodic Disbondment 1.5 volts at 77-degrees F. Results to equal no more than 0.5 mm undercutting after thirty (30) days.
        3) Immersion Testing rated using ASTM D-714-87.
            a) 20 percent Sulfuric Acid - No effect after two (2) years.
            b) 25 percent Sodium Hydroxide - No effect after two (2) years.
            c) 160-degrees F Distilled Water - No effect after two (2) years.
            d) 120-degrees F Tap Water (scribed panel) - 0.0 undercutting after two (2) years with no effect.
    c. An abrasion resistance of no more than 4 mils loss after one million cycles - European Standard EN 598: 1994 Section 7.8 Abrasion Resistance.

d. Interior of the pipe shall receive 40 mils dry film thickness.
e. Applicator: The lining shall be applied by a competent firm with a successful history of applying linings to the interior of ductile iron pipe and fittings.
f. Surface Preparation: Pipe surfaces shall be cleaned and sand blasted prior to lining application in accordance with manufacturer's recommended procedures.
g. Inspection and Certification:
    1) All ductile iron pipe and fitting linings shall be checked for thickness using a magnetic film thickness gauge. The thickness testing shall be done using the method outlined in SSPC-PA-2 Film Thickness Rating.
    2) The interior lining of all pipe barrels and fittings shall be tested for pinholes with a non-destructive 2,500 volt test. Any defects found shall be repaired prior to shipment.
    3) The pipe or fitting manufacturer shall supply a certificate attesting to the fact that the applicator met the requirements of this specification.
h. Product and Manufacturer: Provide one of the following:
    1) Protector 401.
    2) Or equal.

C. Couplings:
1. Refer to Section 15212, Piping Specialties and Accessories.

D. Specials:
1. Transition Pieces:
    a. Furnish suitable transition pieces (adapters) for connections to existing piping.
    b. Unless shown on Drawings, CONTRACTOR shall expose existing piping to determine material, dimensions and other data required for transition pieces.
2. Taps:
    a. Provide taps, where shown or required, for small diameter pipe connections.
    b. Provide corporation stops where shown or required.
    c. Where pipe wall thickness or tap diameter will not permit the engagement of two full threads, provide a tapping saddle conforming to the requirements of Paragraph 2. 1.D.2.b.

2.2 MARKING FOR IDENTIFICATION

A. All pipeline materials shall be stamped, marked or identified with the following:
1. Name or trade mark of the manufacturer.
2. Pipe class.
3. Size and length dimensions.
4. Date and place of manufacture.

2.3 SURFACE PREPARATION AND SHOP PAINTING

A. Exposed pipe and fittings:
1. Clean and prime coat ferrous metal surfaces of piping in the shop in accordance with the requirements of Section 09900, Painting.
2. Field painting shall conform to the requirements of Section 09900, Painting.

B. Buried pipe and fittings:
1. Refer to Paragraph 2.1.B.6.

PART 3 - EXECUTION

3.1 INSTALLATION

A. For buried piping installation, refer to Section 15051, Buried Piping Installation.

B. For exposed piping installation, refer to Section 15052, Exposed Piping Installation.

3.2 INSPECTION

A. CONTRACTOR shall fit all piping to assure that piping is free from defects in material and workmanship. CONTRACTOR shall verify the compatibility of all pipe, fittings and coatings.

+ + END OF SECTION + +

SECTION 15101

GATE VALVES, OPERATORS AND APPURTENANCES

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment and incidentals required to furnish and install all gate valves, operators and appurtenances.
   2. The Work includes, the tapping valves and all other gate valves required for buried, exposed, submerged and other types of piping, except where otherwise specifically included in other Sections.

B. Coordination:
   1. Review installation procedures under other Sections and coordinate with the Work which is related to this Section including buried piping installation, exposed piping installation and site utilities.

C. Related Sections:
   1. Section 01600, General Equipment Provisions.
   2. Section 01730, Operation and Maintenance Data.
   3. Section 09900, Painting.
   4. Section 15051, Buried Piping Installation.
   5. Section 15052, Exposed Piping Installation.
   6. Section 15061, Ductile-Iron Pipe.
   7. Section 15062, Steel Pipe.
   8. Section 15064, Concrete Pipe.
   9. Section 15065, Copper Pipe.
   10. Section 15211, Wall Pipes, Floor Pipes and Pipe Sleeves.
   11. Section 15212, Piping Specialties and Accessories.

1.2 QUALITY ASSURANCE

A. Manufacturer's Qualifications:
   1. Manufacturer shall have a minimum of five (5) years of experience in the production of substantially similar equipment, and shall show evidence of satisfactory service in at least five (5) installations.
   2. Each gate valve shall be the product of one (1) manufacturer.

B. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
   1. ANSI B16.1, Cast Iron Pipe Flanges and Flanged Fittings.
   2. ANSI B16.4, Cast Iron Fittings.
   3. ASTM A 48, Standard Specification for Gray Iron Castings.
   4. ASTM B 62, Standard Specification for Composition Bronze or Ounce Metal Castings.
   5. ASTM A 126, Standard Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.

6. ASTM A 307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
7. ASTM A 354, Standard Specification for Quenched and Tempered Alloy Steel Bolts, Studs and Other Externally Threaded Fasteners.
8. ASTM A 436, Standard Specification for Austenitic Gray Iron Castings.
9. ASTM A 536, Standard Specification for Ductile Iron Castings.
10. AWWA C 111, Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings.
11. AWWA C500, Gate Valves for Water and Sewerage Systems.
12. AWWA C509, Resilient-Seated Gate Valves, 3 through 12 NPS, for Water and Sewerage Systems.
13. AGMA Standards.
14. NEMA, National Electrical Manufacturer's Association.

1.3 SUBMITTALS

A. Shop Drawings: Submit for approval the following:
   1. Manufacturer's literature, illustrations, paint certifications, specifications, detailed drawings, data and descriptive literature on all valves and appurtenances.
   2. Deviations from Contract Documents.
   3. Engineering data including dimensions, materials, size and weight.
   4. Fabrication, assembly, installation and wiring diagrams.

B. Operation and Maintenance Data: Submit complete manuals including:
   1. Copies of all approved Shop Drawings, test reports, maintenance data and schedules, description of operation, and spare parts information.
   2. Furnish Operation and Maintenance Manuals in conformance with the requirements of Section 01730, Operation and Maintenance Data.

C. Shop Tests:
   1. Test motor operated valves before shipment to ensure that the mechanisms can close the valves in the specified time limit, and for proper seating.
   2. Hydrostatic tests shall be performed, when required by the valve specifications included herein.

D. Certificates: Where specified or otherwise required by OWNER, submit test certificates.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the site to ensure uninterrupted progress of the Work.
   1. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete, in ample time to not delay the Work.

B. Handle all valves and appurtenances very carefully. Valves which are cracked, dented or otherwise damaged or dropped will not be accepted.

C. Store materials to permit easy access for inspection and identification. Keep steel members off the ground, using pallets, platforms or other supports. Protect steel members and packaged materials from corrosion and deterioration.

D. Store all mechanical equipment in covered storage off the ground and prevent condensation.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General:
   1. Valves shall have manufacturer's name and working pressure cast in raised letters on valve body.
   2. Manual valve operators shall turn clockwise to close, unless otherwise specified. Valves shall indicate the direction of operation.
   3. Unless otherwise specified, all flanged valves shall have ends conforming to ANSI B16.1, Class 125.
   4. Buried valves shall have flanged ends with mechanical joint adapters and installed with a flanged adapter. All bolts, nuts and washers shall be Type 316 stainless steel.
   5. Buried valves shall be provided with adjustable two-piece valve boxes and provided with extension stems, operating nuts and covers unless otherwise shown or specified. Extension stems shall terminate 12 inches below finished grade.
   6. Unless otherwise specified, bronze gate valves shall be provided with integral seats.
   7. Iron body valves shall be provided with screwed-on seat rings. Buried or submerged gate valves shall be of the nonrising stem type. Exposed gate valves shall be rising stem type. Rising stem valves and brass nonrising stem valves shall be provided with 0-ring stem seals.
   8. All bolts, nuts, washers and studs on or required to connect buried or submerged valves shall be Type 316 stainless steel.
   9. All bolts and studs embedded in concrete and studs required for wall pipe shall be of Type 316 stainless steel.
   10. All other bolts, nuts and studs shall, unless otherwise approved, conform to ASTM A 307, Grade B; or ASTM A 354.
   11. Bolts and nuts shall have hexagon heads and nuts.
   12. Gasket material and installation shall conform to manufacturer's recommendations.
   13. Identification: Identify each valve 4-inches and larger with a stainless steel nameplate stamped with the approved designation. Nameplate shall be permanently fastened to valve body at the factory. Stenciled designations are acceptable for buried valves.

B. Gate Valves:
   1. 2-1/2-inches Diameter and Smaller: Valves shall be bronze screwed ends, solid wedge, rising stem, screwed bonnet type with screwed ends suitable for 150 psi service.
      a. Product and Manufacturer: Provide one of the following:
         1) Jenkins Brothers.
         2) Crane Company.
         3) Or equal.

   2. 3-Inch Diameter and Larger (except tapping valves):
      a. Valves shall be iron body, bronze mounted, non-rising stem , full length body (Wafer Body type is unacceptable) and in conformance with AWWA C500 and ASTM A126, Class B.
      b. Seat Rings: Seat rings shall be bronze, Grade A and in conformance with AWWA C500, Section 3.8.
      c. Unless otherwise shown or specified, exposed valves shall have flanged ends conforming to ANSI B 16.1, Class 125. Buried valves shall be provided with flanged ends with mechanical joint adapters. All bolts shall be Type 316 stainless steel.

d. Exposed manually operated gate valves shall be equipped with hand wheels. Gate valves located more than five feet above the operating floor shall be provided with chainwheels, sprockets, and aluminum chain. The chain shall extend to three feet above the operating floor.
e. Buried gate valves shall be furnished with valve boxes, nut operated extension stems and tee wrenches as required, unless indicated otherwise on the Drawings. The Tapping valve shall be provided with an access manhole as indicated on the Drawings.
f. Shop Painting:
   1) Interior metal surfaces of cast iron valves except finished or bearing surfaces shall be shop painted with two (2) coats of a NSF 61 approved epoxy coating applied in accordance with the manufacturer's recommendations.
   2) Exterior surfaces of the valves shall be shop painted as specified hereinafter under Paragraph 2.3, below.
g. Product and Manufacturer: Provide one of the following:
   1) Mueller Company.
   2) Dresser Manufacturing Division, M&H Division.
   3) Or equal.

C. Tapping Valves
1. General: The tapping valves shall be the resilient seated type. The tapping valves shall be manufactured and tested to exceed the requirements of ANSI and AWWA C-509-94. The valves shall be approved to meet ISO-9001 quality assurance standards.
2. Materials: The valve body shall be ductile iron or cast iron, with a full port opening equal to or exceeding the diameter of the corresponding pipe. In vertical installations, the body shall have integrally cast guides to ensure the gate is properly guided through complete travel, and shall be free of pockets and bridges in the bottom of the valve.

   The sealing mechanism shall consist of a free draining, by-directional compression gate to ensure a 100% bubble tight seal in the closed position. The gate valve shall be constructed of a maintenance free rubber seal mechanically retained between two epoxy coated gate halves fastened with Type 316 stainless steel hardware. The seat sealing mechanism shall be field accessible for replacement of the rubber seal without replacement of the entire wedge assembly. The resilient seated tapping gate valves shall operate freely in the horizontal position, incorporating a roller mechanism securely fixed to the wedge mechanism allowing the wedge to roll freely in the body for low torque and easy operation.

   The tapping valves shall be provided with a resilient seated valve by-pass integrally mounted onto the valve body and located in a parallel position to the spindle. The incorporation of an offset bevel gear allows the 2-inch nut to be positioned and operated perpendicular to the water main. The valve stem shall be Type 316 stainless steel and be independent of the bronze stem nut. A four bolt bonnet cover shall contain a grit and dust cap protecting two "O"-ring stem seals and nylon bushing located above the thrust collar and bonnet serving as an anti-friction device. All internal and external ferrous surfaces of the valve including the interior and exterior of both gate halves shall be coated. The coating shall be an epoxy coating meeting the requirements of NSF 60/61, AWWA C-550 and suitable for potable water. End connections shall be provided to mate with the connecting pipes.

2.2 VALVE APPURTENANCES

A. Extension Stems, Stem Guides, Wrenches and Keys:

1. Extension stem shall be at least as large as the valve stem it operates.
2. Provide intermediate stem guide for extensions more than 7 feet long.
3. Stem brackets and guides shall be made of cast iron and have fully adjustable bronzed bushed guide block. Fasten brackets to walls with approved expansion bolts.
4. Operating nuts about 2-inches square shall be included with each extension stem and located in floor box or grating recess, as required.
5. Provide operating key or wrench of suitable length and size for each valve that is not readily accessible to direct operation.

B. Floor Boxes: Provide cast iron floor boxes for all valves to be operated from floor above valve. Boxes shall be equal in depth to floor slab. Boxes shall have cast iron covers and shall be fitted with bronze bushing.

C. Manual Operators: Unless specified otherwise, valves less that 12-inches shall be provided with handwheels and valves 12-inches and larger shall be provided with geared operators.

D. Chain Operators:
1. All valves more than 5-feet 0-inches above the operating floor level shall be equipped with chain operator and sprocket wheel bolted directly to the valve operating wheel.
2. Aluminum chain shall be provided. Equip all operators with a 1/2-inch hook bolt located to keep chain out of walking areas.

E. Valve Boxes: Provide each buried valve with a valve box as follows:
1. Made of heavy pattern cast-iron, 2-piece adjustable telescoping type.
2. Lower section shall enclose operating nut and stuffing box and rest on bonnet.
3. Inside diameter shall be at least 4-1/2-inches.
4. Provide extension stem and operating nut.
5. Cover shall be heavy-duty cast iron with direction to open arrow cast in.

2.3 PAINTING

A. Clean and prime coat ferrous metal surfaces of equipment in the shop in accordance with the requirements of Section 09900, Painting.

B. Coat machined, polished and non-ferrous surfaces including gears, bearing surfaces and similar unpainted surfaces with corrosion prevention compound which shall be maintained during storage and until equipment begins operation.

C. Field painting shall conform to the requirements under Section 09900, Painting.

D. CONTRACTOR shall certify, in writing, that the shop primer and coating system is compatible with the finish coating system in accordance with Section 09900, Painting.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install all valves and appurtenances in accordance with manufacturer's instructions.

B. Install all valves so that operating handwheels or wrenches may be conveniently turned from operating floor but without interfering with access, and as approved by OWNER.

C. Unless otherwise approved in writing, install all valves plumb and level. Install valves free from distortion and strain caused by misaligned piping, equipment or other causes.

D. Set valve boxes plumb and centered with the bodies directly over the valves. Carefully tamp earth fill around each valve box to a distance of 4 feet on all sides of the box, or to the undisturbed trench face, if less than 4 feet.

3.2 FIELD TESTS AND ADJUSTMENTS

A. Adjust all parts and components as required to provide correct operation.

B. Conduct functional field test of each valve in presence of OWNER to demonstrate that each part and all components together function correctly.

3.3 MANUFACTURER'S SERVICE

A. CONTRACTOR shall provide the services of a qualified factory-trained serviceman to check and approve the installation of the following types of valves:
   1. Gate valves

B. Serviceman shall instruct OWNER'S personnel in operation, care and maintenance and supervise initial operation.

+ + END OF SECTION + +

SECTION 15292
POLYVINYL CHLORIDE (PVC) PRESSURE PIPE (AWWA C900)

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section includes materials, installation, and testing of PVC pressure pipe conforming to AWWA C900. Size range is 4- to 12-inch nominal pipe size.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Drawings.
B. Record Drawings and Submittals: Package 0 Division 1 Specifications.
C. Trenching, Backfilling, and Compacting: Specification 02220.
D. Buried Piping Installation: Specification 15051.
E. Ductile Iron Pipe: Specification 15061.
F. Disinfection of Piping: As called out on Drawings.
G. Pressure Testing of Piping: As called out on Drawings.

1.3 SUBMITTALS

A. Submit submittal packages in accordance Division 1 Specifications of Package 0.

B. Provide affidavit of compliance with AWWA C900.

C. Submit fully dimensioned cross section of the bell and barrel of the pipe. Show the bell maximum outside diameter in the pressurized area and its minimum wall thickness at the same location.

D. Submit copies of the following manufacturer required tests conducted on the project pipe:
   1. Quick-burst strength of pipe and couplings.
   2. Flattening resistance of pipe.
   3. Record of additional tests after test sample failure.

E. Submit manufacturer's literature on ductile iron fittings including dimensions, thickness, weight, coating, lining, and a statement of inspection and compliance with the acceptance tests of AWWA C110 or C153. Submit copy of report of pressure tests for qualifying the designs of all sizes and types of AWWA C153 fittings that are being used in the project. The pressure test shall demonstrate a minimum safety factor of three times the rated working pressure as described in AWWA C153, Section 5.5.

F. Submit manufacturer's catalog data and descriptive literature for high deflection couplings, repair couplings, service saddles, restrained joints, tracer wire, marking tape, and miscellaneous piping materials.

G. Submit restrained joint system installation instructions. Include bolt torque limitations and assembly tolerances.

H. Submit NSF 61 certification for pipe to be used for potable water service.

1.4 INSPECTION AND FIELD VERIFICATION

A. Where new pipelines are to be connected to existing waterlines of the OWNER, the Contractor shall verify in the field the location, elevation, pipe material, pipe outside diameter, and any other characteristics of the existing waterline before proceeding with the pipe installation. This field verification shall be performed in the presence of the OWNER'S Representative. Adjust and align the new piping as necessary to meet the field conditions and provide all required material, labor, and equipment to make the connection.

PART 2 - MATERIALS

2.1 PVC PIPE

A. Provide PVC pipe conforming to AWWA C900 with material cell classification 12454-B per ASTM D 1784. Provide standard pipe having integral bell and spigot with elastomeric gasket and cast-iron equivalent outside diameter. Provide pipe in standard 20-foot laying lengths. Straight pipe sections with plain ends for use with high deflection couplings are not available. Random lengths will not be permitted. Provide either Class 200 pressure rating. Where PVC pipe is to be installed with restrained joints, provide Class 200 pipe. Pipe used for potable water service shall be NSF 61 certified.

2.2 PVC PIPE COLORING AND MARKING FOR VARIOUS WATER SERVICE

A. For reclaimed water, non-potable water or effluent, PVC pipe shall be purple (Pantone 522) and shall be marked on both sides of the pipe with the wording "CAUTION: RECYCLED WATER--DO NOT DRINK." The lettering shall be minimum 1-inch-high black letters and shall be repeated every 36 inches. The purple coloring shall be achieved by adding pigment to the PVC material as the pipe is being manufactured.

B. For raw sewage, PVC pipe shall be green and shall be marked on both sides of the pipe with the wording "CAUTION: DO NOT DRINK." The lettering shall be minimum 1-inch-high black letters and shall be repeated every 36 inches. The green coloring shall be achieved by adding pigment to the PVC material as the pipe is being manufactured.

C. For potable water, PVC pipe shall be blue and shall be marked on both sides of the pipe with the wording "POTABLE WATER." The lettering shall be minimum 1-inch-high black letters and shall be repeated every 36 inches. The blue coloring shall be achieved by adding pigment to the PVC material as the pipe is being manufactured.

2.3 HIGH DEFLECTION COUPLINGS

A. Provide PVC couplings with twin elastomeric gaskets which allows 2 degrees of deflection at each gasket for a total of 4 degrees per coupling. Provide couplings for cast iron equivalent outside diameter with 200 psi working pressure rating. Provide CertainTeed High Deflection (HD) Stop Couplings, or OWNER approved equal.

2.4 CLOSURE/REPAIR COUPLINGS

A. Provide PVC couplings with twin elastomeric gaskets which are designed to connect plain ends of straight pipe. Provide couplings for cast iron equivalent outside diameter with 200 psi working pressure rating. Do not deflect pipe in these couplings. Provide CertainTeed Closure/Repair Couplings, or OWNER approved equal.

2.5 FITTINGS

A. Provide ductile iron fittings conforming to AWWA C110 with a minimum rated working pressure of 350 psi. Provide fittings with bells and gaskets specifically designed for cast iron equivalent outside diameter PVC pipe. Use mechanical joint fittings or fittings with bells and gasket ends.

B. In lieu of paragraph 2.05, A., provide ductile iron fittings conforming to AWWA C153 with a minimum rated working pressure of 350 psi. Provide fittings constructed of Grade 70-50-05 ductile iron having a minimum weight equal to the weight tabulated in AWWA C153. Provide fittings with bells and gaskets specifically designed for cast iron equivalent outside diameter PVC pipe. Use mechanical joint fittings or fittings with bells and gasket ends conforming to the dimensional values of AWWA C111. Mechanical joint glands shall be Grade 70-50-05 ductile iron and cast in one continuous ring. Fittings with repaired defects are not acceptable and will be rejected.

C. For mechanical joint fittings with glands, use tee-head or non-hex head bolts and hex head nuts for joint makeup and gasket seating. Bolts and nuts shall be carbon steel and coated with a corrosion inhibiting fluoropolymer composite material. Provide Tripac 200 Blue Coating System, or OWNER approved equal.

2.6 LINING AND COATING FOR FITTINGS

A. Line interior of fittings for water pipelines with cement mortar per AWWA C104. Provide double thickness lining and use cement conforming to ASTM C150 Type II.

B. Coat exterior of fittings for water pipelines with an asphalt material per AWWA C151.

C. All fittings for sewer force mains shall be glass lined and coated per Standard Specification Section 09870. Coating shall be holiday free on the interior surfaces of the fittings, including the bells.

2.7 FLANGES

A. Flanges on ductile iron fittings shall conform to AWWA C110 or ASME B16.42 Class 150 with a minimum rated working pressure of 250 psi.

2.8 BOLTS, NUTS AND GASKETS FOR FLANGES

A. See Standard Specification Section 15061.

2.9 OUTLETS

A. For outlets 2 inches and smaller with working pressures 200 psi or less, attach a service saddle to the pipe. Provide service saddles with full width, cast bronze bodies conforming to ASTM B 62, O-ring gaskets, and iron pipe threads. Provide Type 304 stainless steel double band straps with four bolts or a single wide strap with four bolts. All stainless steel shall be fully passivated for enhanced corrosion resistance. All saddles shall be pre-sized at the factory for installation on cast iron equivalent outside diameter PVC pipe conforming to AWWA C900. Service saddles shall be Ford Style 202BS, Romac Industries Style 202BS, Smith-Blair Model 393, or OWNER approved equal.
B. For outlets 3 inches and larger, use a ductile iron tee with a flanged outlet.

2.10 RESTRAINED JOINTS

A. When the working pressure is less than 150 psi, provide restrained joints where indicated on the Drawings. Restrained joints shall be provided by restraining systems that incorporate a series of machined serrations on the inside diameter of a restraint ring to provide positive restraint. Restraining systems shall meet or exceed the requirements of UNI-B-13-94 or ASTM F 1674 and the following:
    1. Restraint devices for PVC bell-and-spigot joints shall consist of a split restraint ring installed on the spigot, connected to a solid backup ring seated behind the bell.
    2. Restraint devices for connection to ductile iron mechanical joints shall consist of a split restraint ring installed on the PVC pipe behind the ductile iron fitting follower gland and gasket and shall retain the full deflection capability of the joint.
    3. The split restraint ring shall be machined to match the cast iron equivalent outside diameter of the pipe, provide full 360-degree support around the barrel of the pipe, and shall incorporate a series of machined serrations for gripping the outside surface of the pipe. The serrations shall be uniform and extend the full circumference of the clamp. The ring shall also incorporate a positive means of avoiding applying excessive clamping force to the pipe.

B. Materials used in the restraint device shall be ductile iron conforming to ASTM A 536, Grade 65-45-12.

C. T-bolts, studs, and connecting hardware shall be high strength, low alloy material in accordance with AWWA C111.

D. Design restraining devices to have a minimum of 2:1 safety factor based on the design strength of the pipe. See Section 3.11 for installation directions.

E. Restraining devices shall be Uni-Flange Block Buster Series 1300 and 1350, or OWNER approved equal.

2.11 FLEXIBLE PIPE COUPLINGS

A. See Specification Section 15212.

2.12 FLANGE COUPLING ADAPTERS

A. See Specification Section 15212.

2.13 POLYETHYLENE ENCASEMENT

A. See Standard Specification Section 15051.

2.14 TRACER WIRE

A. See Standard Specification Section 15051.

2.15 MARKING TAPE

A. See Standard Specification Section 15051.

PART 3 - EXECUTION

3.1 PRODUCT MARKING

A. Legibly mark pipe in blue at 5-foot intervals and each coupling to identify the nominal pipe size, OD base, PVC, dimension ratio number and pressure class, AWWA C900, and the seal of the testing agency that verified the suitability of the material for potable water service where applicable.

3.2 DELIVERY AND TEMPORARY STORAGE OF PIPE

A. Ship, store, and place pipe at the storage yard or installation site, supporting the pipe uniformly. Avoid scratching the pipe surface. Do not stack higher than 4 feet nor stack with weight on bells. Cover to protect from sunlight.

B. Do not install pipe that is gouged or scratched forming a clear depression.

C. Do not install pipe contaminated with a petroleum product (inside or outside).

D. Do not install any pipe that shows evidence of exposure to sunlight, age, surface deterioration, or other physical damage. The decision of the OWNER'S Representative shall be final as to the acceptability of the pipe to be installed.

3.3 HANDLING OF PIPE

A. Lift pipes with mechanical equipment using wide belt slings or a continuous fiber rope which avoids scratching the pipe. Do not use cable slings or chains. Pipes up to 12 inches in diameter may be lowered by rolling on two ropes controlled by snubbing. Pipes up to 6 inches in diameter can be lifted by hand.

3.4 SANITATION OF PIPE INTERIOR

A. During laying operations, do not place tools, food, clothing, trash, or other materials in the pipe. Keep the interior of the pipe clean as the pipeline construction progresses. The purpose of

maintaining a clean interior is to aid in the passage of the bacteriologic quality after disinfection.

B. When pipelaying is not in progress, including the noon hour, close the ends of the installed pipe with a plug to deter entry of vermin, children, dirt, storm water, or foreign material.

3.5 PIPE LAYOUT FOR STRAIGHT AND CURVED ALIGNMENTS

A. Use integral bell end pipe for straight alignments and for radii greater than 1,150 feet.

B. Use the following various combinations of plain end pipe lengths with high deflection couplings and integral bell end pipe for curved alignments in both horizontal and vertical directions. Do not bend pipe between couplings. Saw cut integral bell end of standard pipe and bevel end for use with deflection couplings. Pipe lengths shorter than 9 feet will not be used unless specifically authorized by the OWNER'S Representative.
   1. Use 9.5-foot plain end pipe lengths with deflection couplings for all radii between 140 feet to 270 feet.
   2. Use 19-foot plain end pipe lengths with deflection couplings for all radii between 270 feet to 560 feet.
   3. Use an integral bell end pipe length joined together with a 19-foot plain end pipe length to form a chord. Use deflection couplings on each end of the chord and continue this combination through the curved alignment for all radii between 560 feet to 1,150 feet.

3.6 INSTALLING PIPE IN TRENCH

A. See Standard Specification Section 02223 for earthwork requirements.

B. Inspect each pipe and fitting before lowering into the trench. Clean ends of pipe thoroughly. Remove foreign matter and dirt from inside of pipe and keep clean during and after laying.

C. Handle pipe in a manner to avoid any damage to the pipe. Do not drag pipe over the ground, drop it onto the ground, or drop objects on it. Do not drop or allow pipe to fall into trenches.

D. Laying tolerances for the installed pipe shall not vary greater than 0.3-foot horizontally, or greater than 0.1-foot vertically from the alignment and elevations shown on the Drawings.

E. Grade the bottom of the trench to the line and grade to which the pipe is to be laid. Remove hard spots that would prevent a uniform thickness of pipe base material (imported sand). Before laying each section of the pipe, check the grade and correct any irregularities found. The trench bottom shall form a continuous and uniform bearing and support for the pipe at every point between bell holes, except that the grade may be disturbed for the removal of pipe handling slings.

F. At the location of each joint, dig bell holes in the bottom of the trench and at the sides to permit visual inspection of the entire joint and to prevent the pipe from being supported by the bell end or fitting.

G. Keep the trench in a dewatered condition during pipelaying.

3.7 ASSEMBLING PIPE JOINTS

A. The spigot and integral bell or coupling shall be dirt free and slide together without displacing the rubber ring gasket. Lay the pipe section with the integral bell facing the direction of laying.

B. Clean the groove of the bell or coupling of all foreign materials. If the gasket groove is dirty or contains debris, carefully remove the gasket and clean the groove. Insert the gasket back into the groove of the bell or coupling prior to installation. Observe the correct direction of the shaped gasket. Feel that the gasket is completely and evenly seated in the groove.

C. Mark the full insertion depth on the spigot end of the pipe. This mark indicates when the pipe is fully inserted into the bell or coupling. Lubricate the exposed gasket surface and the beveled spigot up to the full insertion mark with the lubricant supplied by the pipe manufacturer. For repair couplings, lubricate pipe for the entire distance the coupling will travel on the pipe. If the lubricated pipe end touches dirt, clean the pipe end and reapply lubricant.

D. Insert the spigot into the bell or coupling and force it slowly into position.

E. Check that the rubber ring gasket has not left the groove during assembly by passing a feeler gage around the completed joint.

3.8 INSTALLING BURIED FITTINGS

A. The OWNER'S Representative will inspect all fittings prior to installation for damage to the interior protective coatings. Coating shall be holiday free on interior surfaces. Patch damaged areas in the field with material similar to the original.

B. For mechanical joint fittings, clean the bell socket and the plain end of the pipe of all foreign material and dirt. Place the gland on the pipe spigot with the lip extension toward the plain end. Lubricate the pipe spigot and gasket. Use the same lubricant as supplied by the pipe manufacturer. Install the gasket on the pipe spigot with the narrow edge of the gasket toward the plain end. Insert the pipe into the bell socket and press the gasket firmly into the gasket recess. Keep the joint straight during assembly. Push the gland towards the socket and center it around the pipe with the gland lip against the gasket. Insert bolts and hand tighten nuts. Make joint deflection after assembly but before tightening nuts. Uniformly tighten bolts and nuts in a progressive diametrically opposite sequence, and torque nuts to 75- to 90-foot-pounds with a calibrated torque wrench. Coat exposed surfaces of tee-head bolts and nuts after tightening with primer for wax tape coating.

C. When necessary to deflect pipe from a straight line in either the horizontal or vertical plane, do not exceed the following joint deflection angles for buried fittings. The angles shown are for each joint and are maximum deflections.

Nominal Pipe Size (inches)	Mechanical Joint (degrees)	Push-on Joint (degrees)
4 6 8	6-1/2 5-1/2 4	4 4 4
10	4	4
12	4	4

3.9 INSTALLING FLANGED JOINTS

A. See Standard Specification Section 15051 for installation instructions.

3.10 INSTALLING SERVICE SADDLES

A. Place the service saddle on the pipe and hand tighten the nuts while positioning the saddle in its final location. Uniformly tighten the nuts in a progressive diametrically opposite sequence and torque with a calibrated torque wrench to the saddle manufacturer's recommended values.

B. Connect a corporation stop to the saddle. Apply Teflon joint compound or tape to the male threads before installing the corporation stop. Make joints watertight.

C. Mount a tapping machine on the corporation stop to cut a hole in the pipe with a shell type cutter made specifically for PVC pipe. Do not use other devices or hand equipment to bore through the pipe wall.

3.11 INSTALLING RESTRAINED JOINTS

A. Follow the manufacturer's installation instructions for the restrained joint system. Tighten the clamping bolts on the restraint rings to the recommended torque. Do not over-tighten the retaining nuts behind the restrainer ears.

B. Wrap restrained joint including bolts and nuts with wax tape coating per Standard Specification Section 09952.

3.12 INSTALLING FLEXIBLE PIPE COUPLINGS

A. Install flexible pipe couplings per Standard Specification Section 15212.

3.13 INSTALLING FLANGE COUPLING ADAPTERS

A. Install flange coupling adapters per Standard Specification Section 15212.

3.14 INSTALLING POLYETHYLENE ENCASEMENT

A. Wrap buried service saddles, fittings, flanged joints, and restrained joints with polyethylene material. Wrap metallic items and buried joints with polyethylene sheet and overlap the adjoining pipe a minimum of one foot. Secure in place with 2-inch-wide plastic adhesive tape. Complete the wrap prior to placing concrete anchors, supports, or thrust blocks per Standard Specification Section 02223. Repair polyethylene material damaged during construction.

3.15 INSTALLING TRACER WIRE

A. Prior to backfill, install tracer wire on top of pipe and secure in place with 2-inch wide plastic adhesive tape at maximum 10-foot intervals. Run tracer wire continuously along pipe and terminate in adjacent valve boxes for buried assemblies or buried valves. Where buried splices occur, use an electrical splicing kit consisting of a split bolt connector, mold, and a two part encapsulating epoxy resin such as Scotchcast, or OWNER approved equal. Provide 24 inches of coiled wire at access points for attachment of pipe locating equipment. Each installed run of pipe shall be capable of being located using the tracer wire. Protect wire insulation from damage during installation and backfilling. Wire insulation that is broken, cut, or damaged shall be replaced.

3.16 INSTALLING MARKING TAPE

A. After the pipe zone has been backfilled and compacted, place the marking tape on the compacted pipe zone material and center over the pipe. Run tape continuously along the trench and tie ends of tape together. Wrap marking tape around valve box extension pipes and continue along pipe.

3.18 PRESSURE TESTING

A. See Drawings.

3.19 DISINFECTION

A. See Drawings.

+ +END OF SECTION + +

SECTION 15293

POLYVINYL CHLORIDE (PVC) DISTRIBUTION PIPE (AWWA C905)

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section includes materials, installation, and testing of PVC distribution pipe conforming to AWWA C905. Size range is 12 to 30-inch nominal pipe size. Maximum working pressure will be limited to 80 psi with a dimension ratio (DR) of 51.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Standard Drawings.
B. Record Drawings and Submittals: Division 1 of Package 0.
C. Trenching, Backfilling, and Compacting: STD SPEC 02223.
D. General Piping Requirements: STD SPEC 15051 and 15052.
J. Miscellaneous Piping Specialties: STD SPEC 15212.
K. Flexible Pipe Couplings: STD SPEC 15212.
L. Disinfection of Piping: See Drawings.
M. Pressure Testing of Piping: See Drawings.

1.4 SUBMITTALS

A. Submit submittal packages in accordance with Division 1 requirements.

A. Provide affidavit of compliance with AWWA C905.

B. Submit copies of the following manufacturer required tests conducted on the project pipe:
   1. Quick-burst strength of pipe.
   2. Flattening resistance of pipe.
   3. Impact resistance of pipe.
   4. Acetone-immersion test of pipe material.
   5. Internal pressure and vacuum tests of joints per ASTM D 3139.
   6. Laboratory tests of gaskets per ASTM F 477.
   7. Record of additional tests after test sample failure.

C. Submit manufacturer's literature on ductile iron fittings including dimensions, thickness, weight, coating, lining, and a statement of inspection and compliance with the acceptance tests of AWWA C110 or C153. Submit copy of report of pressure tests for qualifying the designs of all sizes and types of AWWA C153 fittings that are being used in the project. The pressure test shall demonstrate a minimum safety factor of three times the rated working pressure as described in AWWA C153, Section 5.5.

D. Submit manufacturer's catalog data and descriptive literature for couplings, service saddles, tracer wire, marking tape, and miscellaneous piping materials.

1.5 INSPECTION AND FIELD VERIFICATION

A. Where new pipelines are to be connected to existing waterlines of the OWNER, the Contractor shall verify in the field the location, elevation, pipe material, pipe outside diameter, and any other characteristics of the existing waterline before proceeding with the pipe installation. This field verification shall be performed in the presence of the OWNER'S Representative. Adjust and align the new piping as necessary to meet the field conditions and provide all required material, labor, and equipment to make the connection.

PART 2 - MATERIALS

2.1 PVC PIPE

A. Provide PVC pipe conforming to AWWA C905 with material cell classification 12454-B per ASTM D 1784. Provide standard pipe having integral bell and spigot with elastomeric gasket. Provide pipe in standard 20-foot laying lengths. Straight pipe sections with plain ends for use with high deflection couplings are not available. Random lengths will not be permitted. Provide pipe with cast iron equivalent outside diameter and a dimension ratio (DR) of 14.

2.2 PVC PIPE COLORING AND MARKING FOR RECLAIMED WATER SERVICE

A. PVC pipe shall be PURPLE and shall be marked on both sides of the pipe with the wording "CAUTION: -DO NOT DRINK." The lettering shall be minimum 1-inch-high black letters and shall be repeated every 36 inches. The PURPLE coloring shall be achieved by adding pigment to the PVC material as the pipe is being manufactured.

2.3 HIGH DEFLECTION COUPLINGS

A. Provide ductile iron connecting pieces with push-on joints for a maximum deflection per each joint as tabulated in paragraph 3.08, D. Couplings shall conform to the same criteria as specified for fittings. Provide U.S. Pipe Bell and Bell TYTON Connecting Pieces, or OWNER approved equal.

2.4 FITTINGS

A. Provide ductile iron fittings conforming to AWWA C110 with a minimum rated working pressure of 150 psi. Provide fittings with bells and gaskets specifically designed for cast iron equivalent outside diameter PVC pipe. Use mechanical joint fittings or fittings with bells and gasket ends.

B. In lieu of paragraph 2.04, A., provide ductile iron fittings conforming to AWWA C153 with a minimum rated working pressure of 150 psi. Provide fittings constructed of Grade 70-50-05 ductile iron having a minimum weight equal to the weight tabulated in AWWA C153. Provide fittings with bells and gaskets specifically designed for cast iron equivalent outside diameter PVC pipe. Use mechanical joint fittings or fittings with bells and gasket ends conforming to the dimensional values of AWWA C111. Mechanical joint glands shall be Grade 70-50-05 ductile iron and cast in one continuous ring. Fittings with repaired defects are not acceptable and will be rejected.

C. For mechanical joint fittings with glands, use tee-head or non-hex head bolts and hex head nuts for joint makeup and gasket seating. Bolts and nuts shall be carbon steel and coated with a corrosion inhibiting fluoropolymer composite material. Provide Tripac 200 Blue Coating System, or OWNER approved equal.

2.5 LINING AND COATING FOR FITTINGS

A. Line interior of fittings with cement mortar per AWWA C104. Provide double thickness lining and use cement conforming to ASTM C150 Type II. Coating on interior bells shall be holiday free.

B. Coat exterior of fittings with an asphalt material per AWWA C151.

C. As an alternative to paragraphs 2.05, A. and B., line and coat fittings and bells with fusion-bonded epoxy. Coating shall be holiday free on interior surfaces of the fittings including the bells.

2.6 FLANGES

A. Flanges on ductile iron fittings shall conform to AWWA C110 or ASME B16.42 Class 150 with a minimum rated working pressure of 150 psi.

2.7 BOLTS, NUTS AND GASKETS FOR FLANGES

A. See Standard Specification Section 15061.

2.8 OUTLETS

A. For outlets 2 inches and smaller with working pressure 150 psi or less, attach a service saddle to the pipe. Provide service saddles constructed completely of Type 304 stainless steel. Saddles shall be a two-piece, full circumference shell band bolted together with six bolts. Saddles shall have O-ring gaskets and outlets for iron pipe threads. All stainless steel shall be fully passivated for enhanced corrosion resistance. All saddles shall be sized for installation on cast iron equivalent outside diameter PVC pipe conforming to AWWA C905. Service saddles shall be Romac Industries Style 305, or OWNER approved equal.

B. For outlets 3 inches and larger, use a ductile iron tee with a flanged outlet.

2.9 RESTRAINED JOINTS

A. Restraint harness of megalug restraint rign design shall be provided.

2.10 POLYETHYLENE ENCASEMENT

A. See Specification Section 15051.

2.11 TRACER WIRE

A. See Specification Section 15051.

2.12 MARKING TAPE

A. See Specification Section 15051.

2.13 FACTORY TESTING OF PIPE

A. Test the quick-burst strength of pipe produced from each extrusion outlet at the beginning of production of each specific material, style, or size; thereafter, test one sample every 24 hours. Test a minimum of five specimens total. Test in accordance with ASTM D 1599. At least three of the test specimens from the production lot shall have a portion of the required markings located at least one pipe diameter away from an end closure. For bell-end pipe, include the bell (with any reinforcement sleeve) as part of at least two specimens.

B. Hydrostatically test each length of pipe including the joint in accordance with Section 4.6 of AWWA C905.

C. Test the flattening resistance of pipe produced from each extrusion outlet at the beginning of production of each specific material or size; thereafter, test one sample every eight-hour shift. Test a minimum of three specimens total. Test per ASTM D 2241, Section 7.6.

D. Test the pipe produced from each extrusion outlet by the acetone-immersion method at the beginning of production of each specific material or size; thereafter, test one sample every eight-hour shift. Test per ASTM D 2152.

E. Perform the sustained pressure test described in ASTM D 2241 at the beginning of production.

F. Perform other factory testing per ASTM D 2241 and AWWA C905.

G. The phrase "beginning of production" means the beginning of production of pipe for this project. Do not use test results from other projects.

H. When any product fails to meet a specified test requirement, perform additional tests to determine which products are acceptable of those produced from the same extruder or mold as of the last favorable test. Reject pipe that fails to meet any test requirement.

PART 3 - EXECUTION

3.1 PRODUCT MARKING

A. Legibly mark pipe at 5-foot intervals to identify the nominal pipe size, OD base, PVC, dimension ratio number and pressure class, AWWA C905, manufacturer's name and production code, and the seal of the testing agency that verified the suitability of the material for potable water service where applicable.

3.2 DELIVERY AND TEMPORARY STORAGE OF PIPE

A. Ship, store, and place pipe at the storage yard or installation site, supporting the pipe uniformly. Avoid scratching the pipe surface. Do not stack higher than 4 feet nor stack with weight on bells. Cover to protect from sunlight.

B. Do not install pipe that is gouged or scratched forming a clear depression.

C. Do not install pipe contaminated with a petroleum product (inside or outside).

D. Do not install any pipe that shows evidence of exposure to sunlight, age, surface deterioration, or other physical damage. The decision of the OWNER'S Representative shall be final as to the acceptability of the pipe to be installed.

3.3 HANDLING OF PIPE

A. Lift pipes with mechanical equipment using wide belt slings. Do not use cable slings or chains.

3.4 SANITATION OF PIPE INTERIOR

A. During laying operations, do not place tools, food, clothing, trash, or other materials in the pipe. Keep the interior of the pipe clean as the pipeline construction progresses. The purpose of maintaining a clean interior is to aid in the passage of the bacteriological quality testing after disinfection.

B. When pipelaying is not in progress, including the noon hour, close the ends of the installed pipe with a plug to deter entry of vermin, children, dirt, storm water, or foreign material.

3.5 PIPE LAYOUT FOR STRAIGHT AND CURVED ALIGNMENTS

A. Use integral bell end pipe for straight alignments and for radii greater than 1,150 feet.

B. Use the following various combinations of plain end pipe lengths with high deflection couplings and integral bell end pipe for curved alignments in both horizontal and vertical directions. Do not bend pipe between couplings. Saw cut integral bell end of standard pipe and bevel end for use with deflection couplings. Pipe lengths shorter than 9 feet will not be used unless specifically authorized by the OWNER'S Representative.
   1. Use 9.5-foot plain end pipe lengths with deflection couplings for all radii between 140 feet to 270 feet.
   2. Use 19-foot plain end pipe lengths with deflection couplings for all radii between 270 feet to 560 feet.
   3. Use an integral bell end pipe length joined together with a 19-foot plain end pipe length to form a chord. Use deflection couplings on each end of the chord and continue this combination through the curved alignment for all radii between 560 feet to 1,150 feet.

3.6 INSTALLING PIPE IN TRENCH

A. See Standard Specification Section 02223 for earthwork requirements.

B. Inspect each pipe and fitting before lowering into the trench. Clean ends of pipe thoroughly.

Remove foreign matter and dirt from inside of pipe and keep clean during and after laying.

C. Handle pipe in a manner to avoid any damage to the pipe. Do not drag pipe over the ground, drop it onto the ground, or drop objects on it. Do not drop or allow pipe to fall into trenches.

D. Laying tolerances for the installed pipe shall not vary greater than 0.3-foot horizontally, or greater than 0.1-foot vertically from the alignment and elevations shown on the Drawings.

E. Grade the bottom of the trench to the line and grade to which the pipe is to be laid. Remove hard spots that would prevent a uniform thickness of pipe base material (imported sand). Before laying each section of the pipe, check the grade and correct any irregularities found. The trench bottom shall form a continuous and uniform bearing and support for the pipe at every point between bell holes, except that the grade may be disturbed for the removal of pipe handling slings.

F. At the location of each joint, dig bell holes in the bottom of the trench and at the sides to permit visual inspection of the entire joint and to prevent the pipe from being supported by the bell end or fitting.

G. Keep the trench in a dewatered condition during pipelaying. Removal of water shall be in conformance with Standard Specification Section 02223.

3.7 ASSEMBLING PIPE JOINTS

A. The spigot and integral bell shall be dirt free and slide together without displacing the rubber ring gasket. Lay the pipe section with the integral bell facing the direction of laying.

B. Clean the groove of the bell of all foreign materials. If the gasket groove is dirty or contains debris, carefully remove the gasket and clean the groove. Insert the gasket back into the groove of the bell prior to installation. Observe the correct direction of the shaped gasket. Feel that the gasket is completely and evenly seated in the groove.

C. Mark the full insertion depth on the spigot end of the pipe. This mark indicates when the pipe is fully inserted into the bell. Lubricate the exposed gasket surface and the beveled spigot up to the full insertion mark with the lubricant supplied by the pipe manufacturer. If the lubricated pipe end touches dirt, clean the pipe end and reapply lubricant.

D. Insert the spigot into the bell and force it slowly into position.

E. Check that the rubber ring gasket has not left the groove during assembly by passing a feeler gage around the completed joint.

3.8 INSTALLING BURIED FITTINGS

A. The OWNER'S Representative will inspect all fittings prior to installation for damage to the interior protective coatings. Coating shall be holiday free on interior surfaces. Patch damaged areas in the field with material similar to the original.

B. For mechanical joint fittings, clean the bell socket and the plain end of the pipe of all foreign material and dirt. Place the gland on the pipe spigot with the lip extension toward the plain end. Lubricate the pipe spigot and gasket. Use the same lubricant as supplied by the pipe manufacturer. Install the gasket on the pipe spigot with the narrow edge of the gasket toward the plain end. Insert the pipe into the bell socket and press the gasket firmly into the gasket recess. Keep the joint straight during assembly. Push the gland towards the socket and center it around the pipe with the gland lip against the gasket. Insert bolts and hand tighten nuts. Make joint deflection after assembly but before tightening nuts. Uniformly tighten bolts and nuts in a progressive diametrically opposite sequence, and torque nuts to 75- to 90-foot-pound with a calibrated torque wrench. Coat exposed surfaces of tee-head bolts and nuts after tightening with primer for wax tape coating per Standard Specification Section 15051.

C. When necessary to deflect pipe from a straight line in either the horizontal or vertical plane, do not exceed the following joint deflection angles for buried fittings. The angles shown are for each joint and are maximum deflections.

Nominal Pipe Size (inches)	Mechanical Joint (degrees)
14	3
16	3
18	2 ½
20	2 ½
24	2

3.9 INSTALLING FLANGED JOINTS

A. See Standard Specification Section 15061 for installation instructions.

3.10 INSTALLING SERVICE SADDLES

A. Place the service saddle on the pipe and hand tighten the nuts while positioning the saddle in its final location. Uniformly tighten the nuts in a progressive diametrically opposite sequence and torque with a calibrated torque wrench to the saddle manufacturer's recommended values.
B. Connect a corporation stop to the saddle. Apply Teflon joint compound or tape to the male threads before installing the corporation stop. Make joints watertight.

C. Mount a tapping machine on the corporation stop to cut a hole in the pipe with a shell type cutter made specifically for PVC pipe. Do not use other devices or hand equipment to bore through the pipe wall.

3.11 INSTALLING FLEXIBLE PIPE COUPLINGS

A. Install flexible pipe couplings per Standard Specification Section 15212.

3.12 INSTALLING FLANGE COUPLING ADAPTERS

A. Install flange coupling adapters per Standard Specification Section 15212.

3.13 INSTALLING POLYETHYLENE ENCASEMENT

A. Wrap buried service saddles, fittings and flanged joints with polyethylene material per Standard Specification Section 09954. Wrap metallic items and buried joints with polyethylene sheet and overlap the adjoining pipe a minimum of one foot. Secure in place with 2-inch-wide plastic adhesive tape. Complete the wrap prior to placing concrete anchors, supports, or thrust blocks per Standard Specification Section 02223. Repair polyethylene material damaged during construction.

3.14 INSTALLING TRACER WIRE

A. Prior to backfill, install tracer wire on top of pipe and secure in place with 2-inch wide plastic adhesive tape at maximum 10-foot intervals. Run tracer wire continuously along pipe and terminate in adjacent valve boxes for buried assemblies or buried valves. Where buried splices occur, use an electrical splicing kit consisting of a split bolt connector, mold, and two part encapsulating epoxy resin such as Scotchcast, or OWNER approved equal. Provide 24 inches of coiled wire at access points for attachment of pipe locating equipment. Each installed run of pipe shall be capable of being located using the tracer wire. Protect wire insulation from damage during installation and backfilling. Wire insulation that is broken, cut, or damaged shall be replaced.

3.15 INSTALLING MARKING TAPE

A. After the pipe has been backfilled and compacted, place the marking tape on the compacted pipe zone material and center over the pipe. Run tape continuously along the trench and tie ends of tape together. Wrap marking tape around valve box extension pipes and continue along pipe.

3.17 PRESSURE TESTING

A. See Drawings.

3.18 DISINFECTION

A. See Drawings.

+ + END OF SECTION + +

SECTION 17141

ULTRASONIC LEVEL TRANSMITTER

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish, install, calibrate, test, adjust and place into satisfactory operation all primary sensors and field instruments furnished under this Section.
   2. CONTRACTOR shall be responsible for installing in-line flow elements (magmeter flow tubes, insert flow tubes, propeller flow meters) and for providing taps in the process piping systems for installation of other flow, pressure and temperature sensing instrumentation.
   3. Drawings and Specifications illustrate and specify functional and general construction requirements of the sensors and field instruments and do not necessarily show or specify all components, wiring, piping and accessories required to make a completely integrated system. CONTRACTOR shall provide all components, piping, wiring, accessories and labor required for a complete, workable and integrated system.

B. Coordination: Coordinate the installation of all items specified herein and required to ensure the complete and proper interfacing of all the components and systems.

1.2 QUALITY ASSURANCE

A. Acceptable Manufacturers:
   1. Furnish primary sensors and field instruments by the named manufacturers or equal equipment by other manufacturers.
   2. The named manufacturers have been specified to establish the standard of quality and performance of the equipment to be supplied.
   3. Obtain all sensors and field instruments of a given type from the same manufacturer.
   4. The primary sensors and field devices shall be interchangeable with similar function existing primary sensors and field devices to minimize spare parts inventory.

B. Manufacturer's Responsibilities and Services:
   1. Design and manufacture the primary sensors and field instruments in accordance with the applicable general design requirements specified in Section 17321, General Requirements, and the detailed specifications herein.
   2. Field supervision, inspection, start-up and training in accordance with the requirements of Section 17323, Check-out, Start-up and Field Testing, and Section 17324, Training.

1.3 PRODUCT DELIVERY. STORAGE AND HANDLING

A. Primary sensors and field instruments shall not be delivered to the site until all product information and system Shop Drawings for the sensors and instruments have been approved. Store in accordance with manufacturer’s recommendations.

1.4 SUBMITTAL

A. Comply with the requirements specified in Section 01340.

1.5 MATERIALS OF CONSTRUCTION FOR WETTABLE PARTS

A. Provide the following materials of construction for primary sensors and field instrument (wetted) parts that come in contact with the following list of process fluids:

PROCESS FLUID	ELASTOMER	METAL	PLASTIC	OTHER
Air	Neoprene	Type 316 SS	Teflon	--
Potable Water	Neoprene	Type 316 SS	Teflon	Ceramic
Sodium Hydroxide	EPDM	Hastelloy C Titanium	Teflon PVC/CPVC	 --
Chlorine Solution, Sample water	Viton	Monel Titanium	Teflon PVC/CPVC	Ceramic

1.6 IDENTIFICATION TAGS

A. All sensors and field instruments shall have an identification tag meeting the following requirements:
   1. Tag numbers for sensors and field instruments shall be as listed on the Drawings as the equipment number (a seven digit number).
   2. The identifying tag number shall be permanently etched or embossed onto a stainless steel tag which shall be fastened to the device housing with stainless steel rivets or self tapping screws of appropriate size.
   3. Where neither of the above fastenings can be accomplished, tags shall be permanently attached to the device by a circlet of 1/16-inch diameter stainless steel wire rope.
   4. All sensors and field instruments mounted on or within panels shall have the stainless steel identification tag installed so that the numbers are easily visible to service personnel.

PART 2 - PRODUCTS

2.1 ULTRASONIC LEVEL TRANSMITTER

A. Type: Non-contact.

B. Functions:
   1. Transducer:
      a. Convert electrical pulses from the transmitter into sonic pulses directed towards the metered surface to measure level.
      b. Receive the reflected sonic pulses and convert them back into electrical pulses for reception by the transmitter.

   2. Transmitter:
      a. Generate and time the electrical pulses.

b. Count and convert the pulse travel times into an analog output signal linearly proportional to level or open channel flow as shown.

C. System Performance Requirements:
1. Accuracy: Not less than ±0.25 percent of full scale.
2. Operating range of not less than 30 feet with deadband; minimum operating range of 12-inches.
3. Beam Pattern: 12 degrees conical.
4. Transmitter Outputs: Provide each of the following:
a. 4-20 MADC, direct acting and isolated, into 750 ohms.
b. Minimum of five independently adjustable alarm setpoint relays with SPDT contact outputs rated at 5 amps, 250 VAC.
c. Loss of echo relay which energizes when measured level falls beyond signal range or signal is interrupted for any other reason. Relay output shall be a SPDT contact rated 5 amps, 250 VAC.
5. Ambient Temperature Range: -20 degrees C to +50 degrees C.
6. Power Consumption: 15 watts maximum.

D. Required Features:
1. Transducer:
a. Teflon/Tefzel ANSI 150 pound flange with minimum 3-inch diameter.
b. Teflon/Tefzel coated with built-in thermal sensor.
2. Transmitter:
a. Solid state construction. Open channel monitoring (OCM) built in formulas to calculate flow based on level measurements.
b. Built-in digital filtering for ENH protection and external acoustical noise rejection.
c. Built-in automatic compensation for variations in temperature, pressure and density of the sonic signal medium.
d. Non-intrusive handheld calibrator for field rangeability and recalibration.
e. Integral backlit LCD indicator scaled in engineering units.
f. Lost Echo and Power On Lights.
g. Internally mounted diagnostic LED's to allow isolation of faults in terms of major components.
h. Designed for operation on 120 VAC ± *1* 5 percent, 60 Hz power supply.
3. Temperature Compensator:
a. Range: -40 degrees C to +73 degrees C.
b. Resistance: 9.6 kohms at 20 degrees C.
c. Construction: Integral with Teflon/Tefzel coated transducer.

E. Accessories:
1. Special PVC jacketed coaxial cable, of the actual length required, for connection between the transducer and transmitter.

F. Product and Manufacturer: Provide the following:
1. HydroRanger, as manufactured by Milltronics.
2. Or equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. CONTRACTOR shall require the system supplier to furnish the services of qualified factory-trained servicemen to assist in the installation of the instrumentation and control system equipment.

B. Install each item in accordance with manufacturer's recommendations and in accordance with the Contract Documents. Transmitters and instruments which require access for periodic calibration or maintenance shall be mounted so they are accessible while standing on the floor.

C. All items shall be mounted and anchored using stainless steel hardware unless otherwise noted.

D. All field instruments shall be rigidly secured to walls, stands or brackets as required by the manufacturer and as shown.

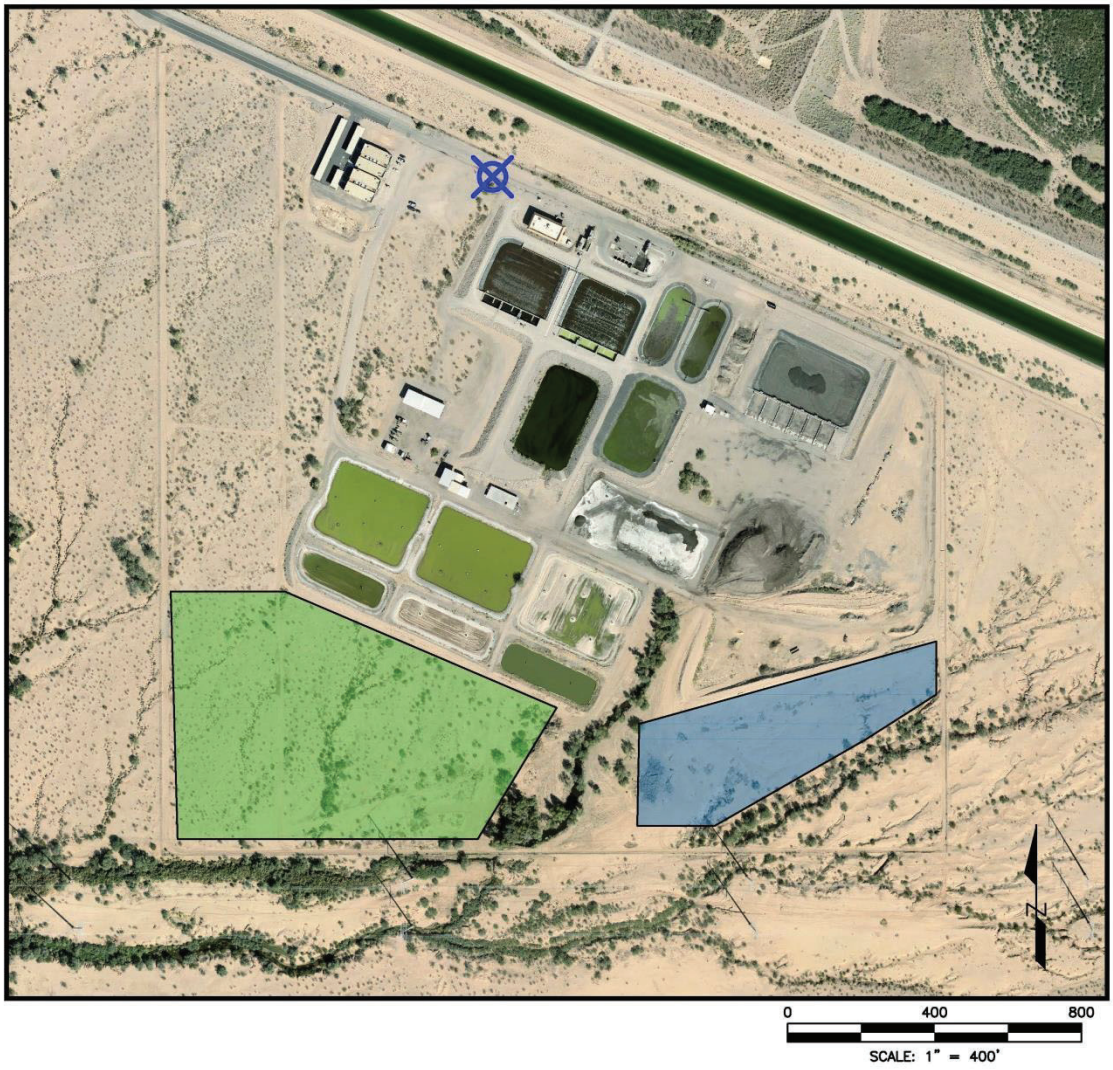
E. Conform to all applicable provisions of the NEMA standards, NEC and local, State and Federal codes when installing the equipment and interconnecting wiring.

3.2 START-UP. CALIBRATION, AND TESTING AND TRAINING

A. Comply with the manufacturer's recommendations.

+ + END OF SECTION + +

EXHIBIT C
Dirt Stockpile & Hydrant Locations



Project 25.08
Construction of Recharge Basin No.12

EXHIBIT D
WIFA Federal Provisions

Federal Provisions

As a condition of receipt of federal financial assistance from the Department of the Treasury, the Grantee provides the assurances stated herein. The federal financial assistance may include federal grants, loans and contracts to provide assistance to the Grantee's beneficiaries, the use or rent of Federal land or property at below market value, Federal training, a loan of Federal personnel, subsidies, and other arrangements with the intention of providing assistance.

Federal financial assistance does not encompass contracts of guarantee or insurance, regulated programs, licenses, procurement contracts by the Federal government at market value, or programs that provide direct benefits. The assurances apply to all federal financial assistance from, or funds made available through the Department of the Treasury, including any assistance that the Grantee may request in the future. The Civil Rights Restoration Act of 1987 provides that the provisions of the assurances apply to all of the operations of the Grantee's program(s) and activity(ies), so long as any portion of the Grantee's program(s) or activity(ies) is federally assisted in the manner prescribed above.

All defined terms used herein that are not otherwise defined or described herein, shall have the meanings ascribed to them in the Agreement attached hereto.

ARTICLE I - ARPA Terms and Conditions

1.1. Accounting. Grantee shall maintain for the purposes of this Agreement an accounting system or procedures and practices that conforms to Generally Accepted Accounting Principles. As defined by 2 C.F.R. Part 200, Subpart A, GAAP "has the meaning specified in accounting standards issued by the Government Accounting Standards Board and the Financial Accounting Standards Board.

1.2. Use of Funds. Grantee understands and agrees that the funds disbursed under this award may only be used in compliance with section 603(c) of the Social Security Act (the Act), Treasury's regulations implementing that section, and guidance issued by Treasury regarding the foregoing.

1.3. Capabilities. Grantee will determine prior to engaging in any project using this assistance that it has the institutional, managerial, and financial capability to ensure proper planning, management, and completion of such project.

1.4. Reporting. The Grantee agrees to comply with any reporting obligations established by Treasury as they relate to this award.

1.5. Maintenance of and Access to Records. Grantee shall maintain records and financial documents sufficient to evidence compliance with section 603(c) of the Act, Treasury's regulations implementing that section, and guidance issued by Treasury regarding the foregoing. The Treasury Office of the Inspector General and the Government Accountability Office, or their authorized representatives, shall have the right of access to records (electronic and otherwise) of Grantee in order to conduct audits or other investigations. Records shall be maintained by Grantee for a period of five (5) years after all funds have been expended or returned to Treasury, whichever is later.

1.6. Pre-Award Costs. Pre-award costs are allowable only to the extent permitted in 2 C.F.R. § 200.458. Pursuant to the Treasury's SLFRF FAQ, Section 2.6, the ARPA final rule permits funds to be used to cover costs incurred beginning on March 3, 2021. Pre-award costs shall be allowable subject to the terms and conditions of the Agreement.

1.7. Administrative Costs. Grantee may use funds provided under this award to cover both direct and indirect costs.

1.8. Compliance with Applicable Law and Regulations. Grantee agrees to comply with the requirements of section 603 of the Act, regulations adopted by Treasury pursuant to section 603(f) of the Act, and guidance issued by Treasury regarding the foregoing. Grantee also agrees to comply with all other applicable federal statutes, regulations, and executive orders, and Grantee shall provide for such compliance by other parties in any agreements it enters into with other parties relating to this award. Federal regulations applicable to this award include, without limitation, the following:

1.8.1. Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards, 2 C.F.R. Part 200, other than such provisions as Treasury may determine are inapplicable to this Award and subject to such exceptions as may be otherwise provided by Treasury. Subpart F – Audit Requirements of the Uniform Guidance, implementing the Single Audit Act, shall apply to this award.

1.8.2. Universal Identifier and System for Award Management (SAM), 2 C.F.R. Part 25, pursuant to which the award term set forth in Appendix A to 2 C.F.R. Part 25 is hereby incorporated by reference.

1.8.3. Reporting Subaward and Executive Compensation Information, 2 C.F.R. Part 170, pursuant to which the award term set forth in Appendix A to 2 C.F.R. Part 170 is hereby incorporated by reference.

1.8.4. OMB Guidelines to Agencies on Governmentwide Debarment and Suspension (Nonprocurement), 2 C.F.R. Part 180, including the requirement to include a term or condition in all lower tier covered transactions (contracts and subcontracts described in 2 C.F.R. Part 180, subpart B) that the award is subject to 2 C.F.R. Part 180 and Treasury's implementing regulation at 31 C.F.R. Part 19.

1.8.5. Grantee Integrity and Performance Matters, pursuant to which the award term set forth in 2 C.F.R. Part 200, Appendix XII to Part 200 is hereby incorporated by reference.

1.8.6. Governmentwide Requirements for Drug-Free Workplace, 31 C.F.R. Part 20.

1.8.7. New Restrictions on Lobbying, 31 C.F.R. Part 21.

1.8.8. Generally applicable federal environmental laws and regulations.

1.9. Statutes and regulations prohibiting discrimination applicable to this award include, without limitation, the following:

1.9.1. Title VI of the Civil Rights Act of 1964 (42 U.S.C. §§ 2000d et seq.) and Treasury's implementing regulations at 31 C.F.R. Part 22, which prohibit discrimination on the basis of race, color, or national origin under programs or activities receiving federal financial assistance.

1.9.2. Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. § 794), which prohibits discrimination on the basis of disability under any program or activity receiving federal financial assistance;

1.9.3. The Age Discrimination Act of 1975, as amended (42 U.S.C. §§ 6101 et seq.), and Treasury's implementing regulations at 31 C.F.R. Part 23, which prohibit discrimination on the basis of age in programs or activities receiving federal financial assistance;

1.9.4. Title II of the Americans with Disabilities Act of 1990, as amended (42 U.S.C. §§ 12101 et seq.), which prohibits discrimination on the basis of disability under programs, activities, and services provided or made available by state and local governments or instrumentalities or agencies thereto; and

1.9.5. The Hatch Act (5 U.S.C. §§ 1501-1508 and 7324-7328), which limit certain political activities of State or local government employees whose principal employment is in connection with an activity financed in whole or in part by this federal assistance.

1.10. Remedial Actions. In the event of Grantee's noncompliance with section 603 of the Act, other applicable laws, Treasury's implementing regulations, guidance, or any reporting or other program requirements, Treasury may impose additional conditions on the receipt of a subsequent tranche of future award funds, if any, or take other available remedies as set forth in 2 C.F.R. § 200.339. In the case of a violation of section 603(c) of the Act regarding the use of funds, previous payments shall be subject to recoupment as provided in section 603(e) of the Act.

1.11. False Statements. Grantee understands that making false statements or claims in connection with this award is a violation of federal law and may result in criminal, civil, or administrative sanctions, including fines, imprisonment, civil damages and penalties, debarment from participating in federal awards or contracts, and/or any other remedy available by law.

1.12. Publications. Any publications produced with funds from this award must display the following language: "This project [is being] [was] supported, in whole or in part, by federal award number [enter project FAIN] awarded to [name of Grantee] by the U.S. Department of the Treasury."

1.13. Debts Owed the Federal Government. Any funds paid to Grantee: (1) in excess of the amount to which Grantee is finally determined to be authorized to retain under the terms of this award; (2) that are determined by the Treasury Office of Inspector General to have been misused; or (3) that are determined by Treasury to be subject to a repayment obligation pursuant to section 603(e) of the Act and have not been repaid by Grantee shall constitute a debt to the federal government. Any debts determined to be owed the federal government must be paid promptly by Grantee. A debt is delinquent if it has not been paid by the date specified in Treasury's initial written demand for payment, unless other satisfactory arrangements have been made or if the Grantee knowingly or improperly retains funds that are a debt as defined in paragraph 14(a). Treasury will take any actions available to it to collect such a debt.

1.14. Disclaimer. The United States expressly disclaims all responsibility or liability to Grantee or third persons for the actions of Grantee or third persons resulting in death, bodily injury, property damages, or any other losses resulting in any way from the performance of this award or any other losses resulting in any way from the performance of this award or any contract, or subcontract under this award. The acceptance of this award by Grantee does not in any way establish an agency relationship between the United States and Grantee.

1.15. Protections for Whistleblowers. In accordance with 41 U.S.C. § 4712, Grantee may not discharge, demote, or otherwise discriminate against an employee in reprisal for disclosing to any of the list of persons or entities provided below, information that the employee reasonably believes is evidence of

gross mismanagement of a federal contract or grant, a gross waste of federal funds, an abuse of authority relating to a federal contract or grant, a substantial and specific danger to public health or safety, or a violation of law, rule, or regulation related to a federal contract (including the competition for or negotiation of a contract) or grant. The list of persons and entities referenced in the paragraph above includes the following:

1.15.1. A member of Congress or a representative of a committee of Congress.

1.15.2. An Inspector General.

1.15.3. The Government Accountability Office.

1.15.4. A Treasury employee responsible for contract or grant oversight or management. An authorized official of the Department of Justice or other law enforcement agency;

1.15.5. A court or grand jury; or

1.15.6. A management official or other employee of Grantee, contractor, or subcontractor who has the responsibility to investigate, discover, or address misconduct.

1.15.7. Grantee shall inform its employees in writing of the rights and remedies provided under this section, in the predominant native language of the workforce.

1.16. Increasing Seat Belt Use in the United States. Pursuant to Executive Order 13043, 62 FR 19217 (Apr. 18, 1997), Grantee should encourage its contractors to adopt and enforce on-the job seat belt policies and programs for their employees when operating company-owned, rented or personally owned vehicles.

1.17. Reducing Text Messaging While Driving. Pursuant to Executive Order 13513, 74 FR 51225 (Oct. 6, 2009), Grantee should encourage its employees, subrecipients, and contractors to adopt and enforce policies that ban text messaging while driving, and Grantee should establish workplace safety policies to decrease accidents caused by distracted drivers.

ARTICLE II – Civil Rights Compliance

2.1. Grantee ensures its current and future compliance with Title VI of the Civil Rights Act of 1964, as amended, which prohibits exclusion from participation, denial of the benefits of, or subjection to discrimination under programs and activities receiving federal financial assistance, of any person in the United States on the ground of race, color, or national origin (42 U.S.C. § 2000d et seq.), as implemented by the Department of the Treasury Title VI regulations at 31 CFR Part 22 and other pertinent executive orders such as Executive Order 13166, directives, circulars, policies, memoranda, and/or guidance documents.

2.2. Grantee acknowledges that Executive Order 13166, "Improving Access to Services for Persons with Limited English Proficiency," seeks to improve access to federally assisted programs and activities for individuals who, because of national origin, have Limited English proficiency (LEP). Grantee understands that denying a person access to its programs, services, and activities because of LEP is a form of national origin discrimination prohibited under Title VI of the Civil Rights Act of 1964 and the Department of the Treasury's implementing regulations. Accordingly, Grantee shall initiate reasonable steps, or comply with the Department of the Treasury's directives, to ensure that LEP persons have meaningful access to its programs, services, and activities. Grantee understands and

agrees that meaningful access may entail providing language assistance services, including oral interpretation and written translation where necessary, to ensure effective communication in the Grantee's programs, services, and activities.

2.3. Grantee agrees to consider the need for language services for LEP persons when Grantee develops applicable budgets and conducts programs, services, and activities. As a resource, the Department of the Treasury has published its LEP guidance at 70 FR 6067. For more information on taking reasonable steps to provide meaningful access for LEP persons, please visit http://www.lep.gov. OMB Approved No. 1505-0271 Expiration Date: April 30, 2025.

2.4. Grantee acknowledges and agrees that compliance with the assurances constitutes a condition of continued receipt of federal financial assistance and is binding upon Grantee and Grantee's successors, transferees, and assignees for the period in which such assistance is provided.

2.5. Grantee acknowledges and agrees that it must require any sub-grantees, contractors, subcontractors, successors, transferees, and assignees to comply with assurances 1-4 above, and agrees to incorporate the following language in every contract or agreement subject to Title VI and its regulations between the Grantee and the Grantee's sub-grantees, contractors, subcontractors, successors, transferees, and assignees: The sub-grantee, contractor, subcontractor, successor, transferee, and assignee shall comply with Title VI of the Civil Rights Act of 1964, which prohibits Grantees of federal financial assistance from excluding from a program or activity, denying benefits of, or otherwise discriminating against a person on the basis of race, color, or national origin (42 U.S.C. § 2000d et seq.), as implemented by the Department of the Treasury's Title VI regulations, 31 CFR Part 22, which are herein incorporated by reference and made a part of this contract (or agreement). Title VI also includes protection to persons with "Limited English Proficiency" in any program or activity receiving federal financial assistance, 42 U.S.C. § 2000d et seq., as implemented by the Department of the Treasury's Title VI regulations, 31 CFR Part 22, and herein incorporated by reference and made a part of this contract or agreement.

2.6. Grantee understands and agrees that if any real property or structure is provided or improved with the aid of federal financial assistance by the Department of the Treasury, this assurance obligates the Grantee, or in the case of a subsequent transfer, the transferee, for the period during which the real property or structure is used for a purpose for which the federal financial assistance is extended or for another purpose involving the provision of similar services or benefits. If any personal property is provided, this assurance obligates the Grantee for the period during which it retains ownership or possession of the property.

2.7. Grantee shall cooperate in any enforcement or compliance review activities by the Department of the Treasury of the aforementioned obligations. Enforcement may include investigation, arbitration, mediation, litigation, and monitoring of any settlement agreements that may result from these actions. The Grantee shall comply with information requests, on-site compliance reviews and reporting requirements.

2.8. Grantee shall maintain a complaint log and inform the Department of the Treasury of any complaints of discrimination on the grounds of race, color, or national origin, and limited English proficiency covered by Title VI of the Civil Rights Act of 1964 and implementing regulations and provide, upon request, a list of all such reviews or proceedings based on the complaint, pending or completed, including outcome. Grantee also must inform the Department of the Treasury if Grantee has received no complaints under Title VI.

2.9. Grantee must provide documentation of an administrative agency or court's findings of non-

compliance of Title VI and efforts to address the non-compliance, including any voluntary compliance or other OMB Approved No. 1505-0271 Expiration Date: April 30, 2025, agreements between the Grantee and the administrative agency that made the finding. If the Grantee settles a case or matter alleging such discrimination, the Grantee must provide documentation of the settlement. If Grantee has not been the subject of any court or administrative agency finding of discrimination, please so state.

2.10. If the Grantee makes sub-awards to other agencies or other entities, the Grantee is responsible for ensuring that sub-recipients also comply with Title VI and other applicable authorities covered in this document State agencies that make sub-awards must have in place standard grant assurances and review procedures to demonstrate that that they are effectively monitoring the civil rights compliance of subrecipients. The United States of America has the right to seek judicial enforcement of the terms of this assurances document and nothing in this document alters or limits the federal enforcement measures that the United States may take in order to address violations of this document or applicable federal law. Under penalty of perjury, the undersigned official(s) certifies that official(s) has read and understood the Grantee's obligations as herein described, that any information submitted in conjunction with this assurances document is accurate and complete, and that the Grantee is in compliance with the aforementioned nondiscrimination requirements.

ARTICLE III - Conflicts of Interest Acknowledgment

3.1. Conflicts of Interest. Grantee understands and agrees it must maintain a conflict of interest policy consistent with 2 C.F.R. § 200.318(c) and that such conflict of interest policy is applicable to each activity (program or project) funded under this award. Grantee must disclose in writing to the Authority, as appropriate, any potential conflict of interest affecting the awarded funds in accordance with 2 C.F.R. § 200.112.

3.1.1. The Grantee must maintain standards of conduct covering conflicts of interest and governing the actions of its employees engaged in the selection, award, and administration of contracts. The standards of conduct must provide for disciplinary actions to be applied for violations of such standards by officers, employees, or agents of the Grantee.

3.1.2. Such a conflict of interest would arise when the employee, officer, or agent, any member of his or her immediate family, his or her partner, or an organization which employs or is about to employ any of the parties indicated herein, has a financial or other interest in or a tangible personal benefit from a firm considered for a contract.

3.1.3. The officers, employees, and agents of the Grantee may neither solicit nor accept gratuities, favors, or anything of monetary value from contractors or parties to subcontracts. No employee, officer, or agent may participate in the selection, award, or administration of a contract supported by a federal award if he or she has a real or apparent conflict of interest. However, Grantees may set standards for situations in which the financial interest is not substantial, or the gift is an unsolicited item of nominal value.

ARTICLE IV - Debarment and SAM.GOV Certification

4.1. The Grantee certifies that, neither the Grantee nor any owner, partner, director, officer, or principal of the Grantee, nor any person in a position with management responsibility or responsibility for the administration of federal funds:

4.1.1. Is presently debarred, suspended, proposed for debarment, and declared ineligible or

voluntarily excluded from covered transactions by any federal or state department/agency;

4.1.2. Has within a three-year period preceding this certification been convicted of or had a civil judgment rendered against it for: commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public transaction or contract (federal, state, or local); violation of federal or state antitrust statutes; or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

4.1.3. Is presently indicted for or otherwise criminally or civilly charged by a governmental entity (federal, state, or local) with commission of any of the offenses enumerated in paragraph (b) above; or

4.1.4. Has within a three-year period preceding this certification had one or more public transactions or contracts (federal, state, or local) terminated for cause or default.

4.2. The Grantee is "Actively" registered with SAMS (Service for Award Management) and has been assigned the following UEI Number: GGNWUJUKR2E6 found at www.sam.gov. Include date SAM.GOV registration begins and ends 04/03/2024-04/03/2025.

4.3. The Grantee further certifies that it shall not knowingly enter into any transaction with any subcontractor, material supplier, or vendor who is debarred, suspended, declared ineligible, or voluntarily excluded from covered transactions by any federal or state department/agency.

ARTICLE V - Lobbying Certificate Disclosure

5.1. For each bid, request for reimbursement, or offer, that exceeds $100,000, the Grantee certifies, to the best of his or her knowledge and belief, that:

5.1.1. No Federal appropriated funds have been paid or will be paid, by or on behalf of the Grantee, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

5.1.2. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the Grantee shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

5.1.3. The Grantee shall require that the language paragraph 1 and 2 of this anti-lobbying certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

5.2. This certification is a material representation of the fact upon which reliance was placed when this

transaction was made or entered into. Submission of this certification is a prerequisite for making or entering this transaction imposed by 31 CFR Part 21.

ARTICLE VI - Audit Statement

6.1. Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards, 2 CFR Part 200, other than such provisions as Treasury may determine are inapplicable to this Award and subject to such exceptions as may be otherwise provided by Treasury. Subpart F – Audit Requirements of the Uniform Guidance, implementing the Single Audit Act, shall apply to this award.

6.2. If Grantee expends more than seven hundred and fifty thousand dollars ($750,000) in federal awards during a fiscal year, Grantee will be subject to an audit under the Single Audit Act and its implementing regulation at 2 C.F.R. Part 200, Subpart F regarding audit requirements and Grantee must:

6.2.1. Provide a copy of Grantee's single audit in the eCivis file reporting area; and

6.2.2. Upload a copy of Grantee's alternative audit or financial budget audit in the eCivis file reporting area.

ARTICLE VII – Non-supplanting Certification

7.1. Supplanting. Federal funds must be used to supplement existing funds for program activities and must not replace those funds that have been appropriated for the same purpose. Supplanting shall be the subject of application review, as well as pre-award review, post-award monitoring, and audit. If the Authority has reason to believe supplanting has or will occur, the Grantee shall supply documentation demonstrating that the reduction in non-federal resources occurred for reasons other than the receipt or expected receipt of federal funds.

7.2. Certification. By signing this Agreement, the Grantee certifies that any funds awarded under this Agreement shall be used to supplement existing funds for activities contemplated under this Agreement and will not supplant or replace nonfederal funds that have been appropriated for the purposes and goals of the Agreement.

7.3. Penalties. The Grantee understands that supplanting violations may result in a range of penalties, including but not limited to suspension of future funds awarded under the Agreement, suspension or debarment from federal grants, recoupment of monies provided under this Agreement, and civil and/or criminal penalties.

ARTICLE VIII – Miscellaneous

8.1. Small and Minority Businesses, Women's Business Enterprises, and Labor Surplus Area Firms. Grantee shall take affirmative steps to solicit and include small, minority, and women owned businesses, when possible, in an effort to encourage participation and fair competition in providing supplies/services described in this solicitation. As set forth in 2 C.F.R. § 200.321(b)(1)-(5), such affirmative steps must include: (1) Placing qualified small and minority businesses and women's business enterprises on solicitation lists; (2) Assuring that small and minority businesses, and women's business enterprises are solicited whenever they are potential sources; (3) Dividing total requirements, when economically feasible, into smaller tasks or quantities to permit maximum

participation by small and minority businesses, and women's business enterprises; (4) Establishing delivery schedules, where the requirement permits, which encourage participation by small and minority businesses, and women's business enterprises; and (5) Using the services and assistance, as appropriate, of such organizations as the Small Business Administration and the Minority Business Development Agency of the Department of Commerce. If subcontracts are to be let, Grantee shall take all necessary affirmative steps to assure that minority businesses, women's business enterprises, and labor surplus area firms are used as required by 2 C.F.R. § 200.321.

ARTICLE IX - Acknowledgment

The Grantee, Apache Junction Sewer District, hereby acknowledges and accepts the above terms and conditions. I hereby certify that I represent a legal entity with authority to enter into this Agreement.

By:_____ Date: 06/13/24
Signature

Darron Anglin, P.E. District Manager
Print Name and Title

For: Apache Junction Sewer District Tax ID No.: 86-0747875
Grantee Name

APACHE JUNCTION SEWER DISTRICT

BID UNDERSTANDING & AGREEMENT

PROJECT 25.08
Construction of Recharge Basin No.12

Proposal to the District Manager of the Apache Junction Sewer District located in Apache Junction, Arizona:

In compliance with the advertisement for bids, and having examined all appropriate contract documents, site work and having become familiar with the local conditions to be met affecting the cost of the Work at the place where the Work is to be done, I/we hereby submit the following proposal for the Project, furnishing each and every item of expense for the construction services of the Work including the necessary permits, labor, materials, equipment, transportation, utilities, project coordination, oversight, management and other incidentals necessary, except as otherwise provided on the sheet titled Exceptions-Additions-Corrections.

In submitting this bid I/we agree to enter into and execute a Contract Agreement if awarded on the basis of this bid proposal, and furnish the required certificates of insurance for the completion of the Work at the location specified, and for the prices set forth on the attached Cost Proposal, amounting to
$_____(Dollars), all inclusive.

I/we understand that construction of the Work for this project shall be in accordance with the District's Standard Specifications of Construction, Project Specifications, plans for the Work and Special Provisions as included. The Construction Contract shall be in compliance with all applicable Local, State, and Federal codes and other requirements, except as otherwise required by the project plans and Special Provisions. I/we further understand that the construction of the Work shall be done to the complete satisfaction of the District Manager of the Apache Junction Sewer District.

This proposal is submitted by _____,

- □ a corporation organized under the laws of the State of _____;
- □ a partnership consisting of _____
  _____
  _____;
- □ or an individual trading such as _____ ,

and is the holder of Arizona State Contractor's License No. _____, Classification: _____,

Respectfully submitted by:

_____
Signature Print Name Title

_____
Mailing Address City State Phone

APACHE JUNCTION SEWER DISTRICT

COST PROPOSAL

PROJECT 25.08
Construction of Recharge Basin No.12

BIDDER: _____

	DESCRIPTION	ESTIMATED QUANTITY	UNITS	UNIT PRICE	TOTAL
1.	MOBILIZATION		LS		
2.	CUT		CY		
3.	FILL		CY		
4.	FINAL GRADING		LS		
5.	SURVEY		LS		
6.	SWPPP		LS		
7.	SALES TAX		LS		
8.					
9.					
10.					
	TOTAL				$

Signature _____ Title _____

Print Name _____ Date _____

EXCEPTIONS - ADDITIONS – CORRECTIONS

PROJECT 25.08
Construction of Recharge Basin No.12

BIDDER:_____

For uniformity comparison purposes, all previous documents shall be completed as received from the Apache Junction Sewer District of Apache Junction. Should the Bidder wish to note any exceptions, additions, or corrections, do so separately on this page and submit with bid.

_____

_____

_____

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_____

APACHE JUNCTION SEWER DISTRICT

LIST OF SUBCONTRACTORS

PROJECT 25.08
Construction of Recharge Basin No.12

BIDDER: _____

SUBCONTRACTOR #1

Firm: _____

Address: _____

_____

Telephone: _____

Principal: _____

SUBCONTRACTOR #2

Firm: _____

Address: _____

_____

Telephone: _____

Principal: _____

SUBCONTRACTOR #3

Firm: _____

Address: _____

_____

Telephone: _____

Principal: _____

SUBCONTRACTOR #4

Firm: _____

Address: _____

_____

Telephone: _____

Principal: _____

CERTIFICATE OF INSURANCE

PROJECT 25.08
Construction of Recharge Basin No.12

The _____ certifies that the following insurance policies have been issued on behalf of:

Name of Insured: _____

Address of Insured: _____

INSURANCE	POLICY NO.	EFFECTIVE	EXPIRATION	LIMITS
Workman's Compensation				$1,000,000 / $1,000,000 / $1,000,000
Contractual Bodily Injury & Property Damage				$1,000,000 Each Occurrence $2,000,000 Aggregate
Automobile Bodily Injury & Property Damage				$1,000,000 Each Person $1,000,000 Each Occurrence

It is further agreed that these policies shall not expire, be canceled or changed except as permitted in the Contract Documents. If a policy does expire during the life of the contract, a renewal Certificate of the required coverage must be sent to the District not less than five (5) days prior to the expiration date. This Certificate is not valid unless signed by an authorized representative of the Insurance Company.

Insurance by: _____ Date: _____
Signature

Printed Name: _____

Title: _____

WIFA AFFIRMATIONS

Affidavit
AUTHORIZED REPRESENTATIVE

I HEREBY AFFIRM THAT:

I am the [title] _____ and the duly authorized representative of the Contractor and that I possess the legal authority to make this Affidavit on behalf of myself and the Contractor for which I am acting.

AFFIRMATION REGARDING BRIBERY CONVICTIONS

I FURTHER AFFIRM THAT:

Neither I, nor to the best of my knowledge, information and belief, the Contractor, nor any of its officers, directors, partners, or any of its employees, if any and as applicable, directly involved in obtaining or performing under agreements, contracts, loans, grants, or awards with public bodies, has been convicted of, or has had probation before judgment imposed, or has pleaded nolo contendere to a charge or bribery, attempted bribery, or conspiracy to bribe in violation of Arizona law, or the law of any other state, or federal law, except as follows [*indicate the reasons why the affirmation cannot be given and list any conviction, plea, or imposition of probation before judgment with the date, court, official or administrative body, the sentence or disposition, the name(s) of person(s) involved, and their current positions and responsibilities with the Grantee*]:

_____
_____
_____
_____

AFFIRMATION REGARDING OTHER CONVICTIONS

I FURTHER AFFIRM THAT:

Neither I, nor to the best of my knowledge, information, and belief, the Contractor, nor any of its officers, directors, partners, or any of its employees, if any and as applicable, directly involved in obtaining or performing under agreements, contracts, loans, grants, or awards with public bodies, has:

1. Been convicted under state or federal statute of a criminal offense incident to obtaining, attempting to obtain, or performing a public or private contract, fraud, embezzlement, theft, forgery, falsification or destruction of records, or receiving stolen property.

2. Been convicted of any criminal violation of a state or federal antitrust statute.

3. Been convicted under the provisions of Title 18 of the United States Code for violation of the Racketeer Influenced and Corrupt Organization Act, 18 U.S.C. § 1961, et seq., or the Mail

Act, 18 U.S.C. § 1341, et seq., for acts arising out of the submission of bids or proposals for a public or private contract.

4. Been convicted of conspiracy to commit any act or omission that would constitute grounds for conviction or liability under any law or statute described in subsection (1), (2), or (3) above.

5. Been found civilly liable under a state or federal antitrust statute for acts or omissions in connection with the submission of bids or proposals for a public or private contract.

6. Admitted in writing or under oath, during the course of an official investigation or other proceedings, acts, or omissions that would constitute grounds for conviction or liability under any law or statute described above, except as follows ***[list each debarment or suspension, providing the dates of the suspension or debarment, the name of the public entity and the status of the proceeding, the name(s) of the person(s) involved and their current positions and responsibilities with the Grantee, and the status of any debarment]:***

_____
_____
_____
_____

AFFIRMATION REGARDING DEBARMENT

I FURTHER AFFIRM THAT:

Neither I, nor to the best of my knowledge, information, and belief, the Contractor, nor any of its officers, directors, partners, or any of its employees, if any and as applicable, directly involved in obtaining or performing under agreements, contracts, loans, grants, or awards with public bodies, has ever been suspended or debarred (including being issued a limited denial of participation) by any public entity, except as follows ***[indicate reasons why the affirmations cannot be given, and list any conviction, plea, or imposition of probation before judgment with the date, court, official or administrative body, the sentence or disposition, the name(s) of the person(s) involved and their current positions and responsibilities with the Grantee, the grounds of the debarment or suspension, and the details of each person's involvement in any activity that formed the grounds of the debarment or suspension]:***

_____
_____
_____
_____

SUBCONTRACT AFFIRMATION

I FURTHER AFFIRM THAT:

Neither I, nor to the best of my knowledge, information, and belief, the Contractor, has knowingly entered into a contract with a public body under which a person debarred or suspended will provide, directly or indirectly, supplies, services, architectural services, construction related services, leases of real property, or construction.

AFFIRMATION REGARDING COLLUSION

I FURTHER AFFIRM THAT:

Neither I, nor to the best of my knowledge, information, and belief, the Contractor, nor any of its officers, directors, partners, or any of its employees, if any and as applicable, have in any way:

1. Agreed, conspired, connived, or colluded to produce a deceptive show of competition in the compilation of the award that is being entered into with the Authority.

2. In any manner, directly or indirectly, entered into any agreement of any kind to fix the bid price or price proposal of the Grantee or of any competitor, or otherwise take any action in restraint of free competitive bidding in connection with the award that is being entered into with the Authority.

3. Colluded with anyone to obtain information concerning the award that would give the Contractor an unfair advantage over others.

ACKNOWLEDGMENT

I ACKNOWLEDGE THAT this Affidavit is to be furnished to the Authority and may be distributed to units of the State of Arizona and the federal government. I further acknowledge that this Affidavit is subject to applicable laws of the United States and the State of Arizona, both criminal and civil, and that nothing in this Affidavit or any contract resulting from the submission of this application for an award shall be construed to supersede, amend, modify, or waive the exercise of any statutory right or remedy conferred by the Constitution and the laws of Arizona with respect to any misrepresentation made or any violation of the obligations, terms, and covenants undertaken by the Grantee with respect to this Affidavit, the award, and other Affidavits comprising part of this Agreement.

I DECLARE AND AFFIRM UNDER THE PENALTY OF PERJURY, UNDER THE LAWS OF THE STSTE OF ARIZONA, THAT THE CONTENTS OF THIS AFFIDAVIT ARE TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE, INFORMATION AND BELIEF.

Date: _____

Signature: _____
Name:
Title:
(Authorized Representative and Affiant)